

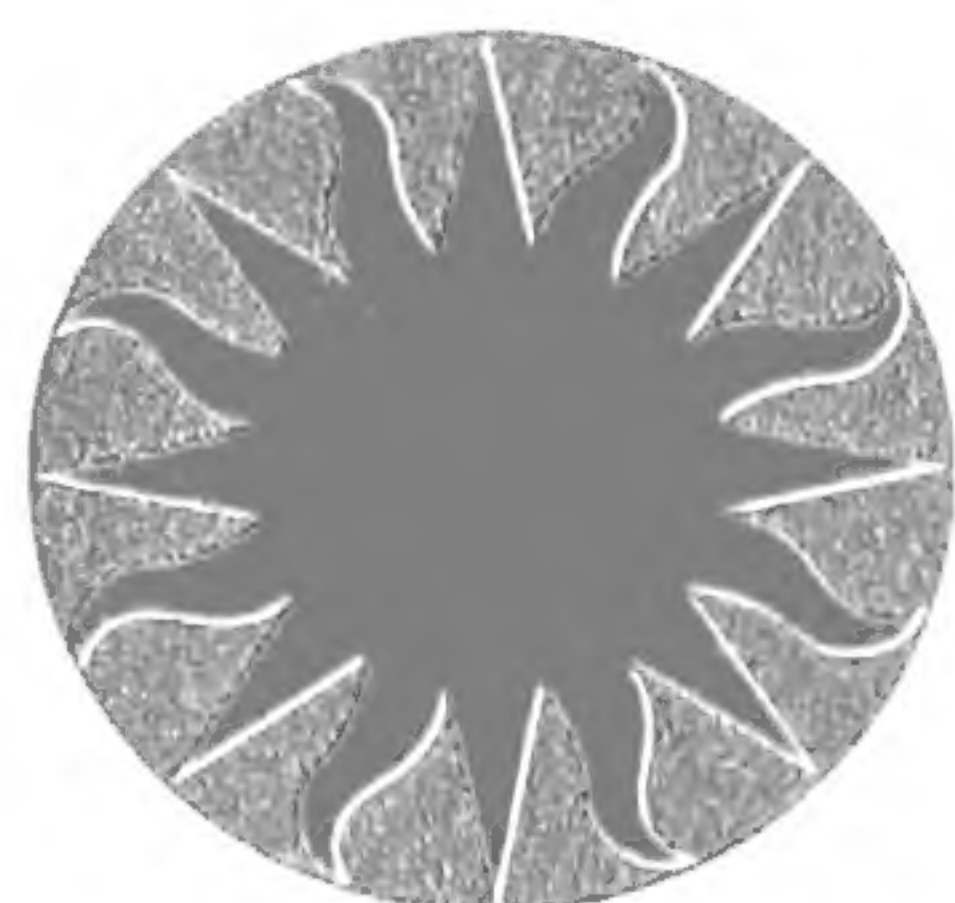
JOHN REID & CO.,

Importers of

Classical & Oriental Books,

81, Queen Street,

GLASGOW.



Smithsonian
Institution
Libraries

Purchased from the
CULLMAN ENDOWMENT

Jerry Stannard
765 - 15th Street
Boulder, Colo. 80304

Jerry Stannard
1119 W. Campus Road
Lawrence, Kan. 66044



BOTANICAL LECTURES.

BY A LADY.

ALTERED FROM

“BOTANICAL DIALOGUES FOR THE
USE OF SCHOOLS,”

AND

ADAPTED TO THE USE OF PERSONS OF ALL AGES,

BY THE SAME AUTHOR.

LONDON:

PRINTED FOR J. JOHNSON, ST. PAUL'S CHURCHYARD,

BY T. BENSLEY, BOLT COURT, FLEET STREET.

1804.

ADVERTISEMENT.

FROM the favourable reception given to my Botanical Dialogues for the Use of Schools, I have been induced to suppose, that the Work might be of more extensive utility, if divested of those parts peculiarly intended for the purposes of education, and altered to a form equally adapted to the use of grown persons as to children. I have, therefore, endeavoured to compose a complete elementary system, which may enable the student, of whatever age, to surmount those difficulties, which hitherto have too frequently impeded the perfect acquirement of this interesting science; and I flatter myself that the following Work, in *Botanical Lectures,*

7

Lectures, will be found an easy introduction to the use of the Translated System of Vegetables, the only English work from which the pupil can become a Linnean, or universal Botanist.

M. E. J.

Oct. 1, 1803.

ANALYSIS.

ANALYSIS OF THE FIRST PART

OF THE

BOTANICAL LECTURES.

LECTURE I.

The Seven Parts of Fructification explained.

PAGE 1, Explanation of Linneus's system. 2, The Linnean terms ought to be made use of; knowledge of Latin of no great use to botanical pupils. 3, Botany has a language peculiar to itself. Term Fructification explained; all parts of it not essential to the product of perfect seed; seven parts of Fructification; Calyx, seven different kinds; these explained. 4, Fool's Parsley distinguished from all other known umbelled plants. 5, Male Bloom of Willow, called Yellow Gossings by children; beauty of different Catkins. Spathe explained. 6, Calyptra, the Calyx of Mosses beautifully shown in Mr. Curtis's London Flora. Volve the Calyx of Funguses. 7, Corol explained; it's leaves called petals. Marks by which the different kinds of Corol are distinguished. Polyanthos a one-petalled Corol. Method of knowing a one-petalled Corol from a Corol of many Petals. 8, Généra of Plants distinguished by the form and position of their Petals. Seven different formed Corols. 9, Nectary, the name given by Linneus to the honey-bearing part of the Corol; not always

a part of the Corol. Stamen, a most essential part of Fructification, consists of three parts. 10, Anther, wrongly called the Seed, explained. Nature has provided for the security of the Dust. On it's preservation depends the continuation of the species. Wet injurious to the Anther-dust. Supposition of the Anther-dust being preserved from injury by a waxy substance surrounding it, erroneous. Mr. John Hunter's experiments prove that the Anther-dust is not Wax. Collected by Bees for Food to the Bee-maggots. 11, Pistil of equal importance with the Stamen; consists of three parts. Anther and Stigma, in botanical language, constitute a Flower; essential to the production of Fruit—late investigations seem to make the Nectary an essential part of Fructification; Honey contained in it intended for the nourishment of the Anthers and Stigmas. 12, The Nectary had not even a name before the time of Linneus. Eight different kinds of Seed-vessel. Sudden manner of the Seed-vessel of Balsam bursting. 13, Two kinds of Silique explained. Distinction between the Silique kind of Seed-vessel and the Legume. Legume the part eaten of the Papilionaceous, or Pea-bloom Flowers. Follicle and Drupe explained. 14, Exceptions to the definition of a Drupe. Defects of the system of Linneus few. 15, Strobile, the Strobiles of Larch, beautiful, commonly called Fir-apples. Seed, definition of it. Seed consists of three parts. 16, Young plants supported in a similar manner to young animals. By soaking an almond kernel in Water, the three parts of the Seed may be well seen. 17, Young Plants perish, if their Seed-lobes or Cotylédons are destroyed. Corn dug out of the ground by Wood Pigeons. Care taken by Nature in the protection and dispersion of Seeds. Muslin made from Cotton. Cotton the soft Cradle of Seeds, as Silk is that of Insects. Aril, that part which surrounds the Seed within it's Vessel, may be seen in Fraxinella and Wood-forrel. 18, Dispersion of Seeds. 19, Beauty of the Seed of Feather-grass: most curious of the Flying Seeds, Tillandsia, a parasite plant: manner in which it's seeds are conveyed

conveyed similar to the migration of Spiders. 20. Beautiful lines in the Botanic Garden, on the migration of the seeds of aquatic plants, and of those which grow on the banks of rivers. Much knowledge to be gained from the Botanic Garden. Birds the means of disseminating some kind of seeds. 21, Mountain Ash on an Apple-tree. Doubtful in what manner Trees growing upon others receive Nourishment. Seeds of Feather-grass, Geranium, and Oat, dislodged from their Receptacles by the twisting of their Awns. 22, Two kinds of Receptacle, Proper Receptacle, and Common Receptacle; Common Receptacle belongs peculiarly to the Compound Flowers. Examples of a Common Receptacle, made use of by Linneus to discriminate the Génera of the Class Syngenesia, United Anthers.

LECTURE II.

A Flower dissected. Fulcra and Inflorescence explained.

PAGE 27, Specimens of the different kinds of Calyx. 28, Peculiarity in the Wheel-form Corol of Verónica. The Genus distinguished by that peculiarity. Hollow protuberance at the base of the Petals of Ranunculus, the Nectary. The essential Mark of that Genus, constant, even in the double Flowers. 29, Flowers more easily to be distinguished from each other than is supposed by those who have not attentively studied their different parts. 30, Specimens of different formed Corols. Corol not always coloured; no obvious rule by which the Calyx and Corol may be distinguished; rule given by Linneus for distinguishing them; 31, his transgression of that rule; advisable to follow the terms of Linneus. Cover of the Crown Imperial, a Corol. 32, Quantity of Honey in the Nectaries of Crown Imperial nicely adapted to the Cavities which contain it. Form of

the particles of Anther-duft perfect and regular. Moisture on the summit of the Stigma fits it to receive the Anther-duft. Germe, the term for the immature Seed-vessel; Pericarp, for that which is mature. 33, Only six parts of Frustrification in the Flower of Crown Imperial. Bract, a part which may be mistaken for a Calyx. Rule for distinguishing the Bract from the Calyx. Green Tuft at the Top of the Stem of the Crown Imperial formed from Bracts; the Bract a part of great use in marking the Species of Plants. 34, Bract one of the Fulcra of Plants. Poppy and Tulip show the Stigma and Germe without a Style. Great increase of Plants from Seed. Beauty of Seeds; great variety in the size, shape, and surface of Seeds. 35, Explanation of the term Fulcra. Seven kinds of Fulcra. Distinction betwixt the terms Peduncle and Petiole. 36, Stipule explained. Stipules of Plants ought to be attended to, as they frequently mark one species from another. Infant Leaves of Tulip-tree perfect in all their parts. Stipules of Plane-tree add to it's beauty in spring. Weak Plants generally furnished with Tendrils. 37, All climbing Plants injurious to the Trees which support them. Dodder seems intended by Nature to draw nourishment from other vegetables. 38, By it's growth, strangles the Plant by which it was fostered. Few instances of this in the Vegetable Kingdom. The injury sustained by the supporting Plant generally small. Orobanche a parasitical Plant from choice. 39, Pubescence might more properly be called a Defence than a Support. Young Leaves and Stems commonly protected by a downy Covering. 40, Arms of Plants, Thorns and Prickles their Defence against Animals. Hollies in Needwood Forest, armed only on their lower branches, afford food to the Deer in severe winters. 41, Curious mechanism of the Sting of a Nettle. Many curious contrivances of Nature for the defence of Plants. Venus's Fly-trap particularly curious. 42, Sun-dew resembles it; easily found on heaths by the red colour of it's leaves. 43, Scape, a particular kind of Flower-stalk. Inflorescence, the term for the different modes by which Flowers are joined

to their Peduncles. Seven different kinds of Inflorescence. 44, One-ranked and two-ranked Spike explained. 45, Distinction betwixt a Corymbe and Umbel. Thyrses and Raceme explained. 46, Wherein the Raceme and Corymbe differ. Panicle explained. Modes of Flowering not comprised under the term Inflorescence. 47, Linneus's definition of the term Rachis. 48, Method of impressing what is taught, upon the memory. The art of making learning agreeable; the more deeply the study of Botany is entered into, the more pleasing it will be found.

L E C T U R E III.

The first Eighteen Classes with their Orders explained.

PAGE 51, Explanation of the term Class: may be compared to a Dictionary. Characteristic mark of a Class arbitrary. On the number and situation of the Stamens the Classes of Linneus are founded; 52, what constitutes a natural Class; most of the Classes of the Linnean system artificial; their being so of little consequence; the great advantages of his system. Labours of many ingenious Botanists of little use from want of arrangement. 53, Much useful knowledge of the ancients lost to the world from their ignorance of the science of Botany. Dr. Grew's book very informing. His opinion of the use of the parts of Fructification agrees with that of Linneus. Linneus's works best calculated to teach the science of Botany. 54, Linneus divided the vegetable kingdom into twenty-four Classes. Character of the first ten Classes. Names of the Numerical Classes taken from the number of Stamens or Males. 55, Useful to be acquainted with the scientific terms of Botany. The translated System of Vegetables found difficult from not being properly studied. 56, Ten first Classes distinguished by their number only. Eleven Stamens not found sufficiently

sufficiently constant to form a Class. 57, Titles of the last three Numerical Classes would mislead if they were not explained. Linneus aware of the defect in the titles. Distinctions of the class Icosandria and Polyandria necessary to be attended to. 58, Fruits belonging to Icosandria have their Calyx remaining when ripe, like a little crown on their summit. 59, Great number of Stamens in the class Polyandria. Explanation of the Orders or first Subdivisions of the Numerical Classes founded on the number of Pistils. 60, A Flower cannot belong to any of the first thirteen Classes, unless it contain both Stamens and Pistils within the same cover. Essential Character of the Eleventh Class. Essential Character of the Twelfth and Thirteenth Classes. 61, Character of the class Two-powers; contains two Orders. Distinguished by their seeds being enclosed by a Vessel or not enclosed. Flowers of the different Orders not similar in their appearance. 62, Class Tetradynamia, or Four-powers, explained, a really natural Class; no exception to this, except the Genus *Cléome*. Divided into two orders from the form of the Seed-vessels. 63, A good deal of variety in the form of the Silicle. Two divisions of the Silicle Order. Seed-vessel of Lady Smock, a Silique. Class Monadelphia, or One-brotherhood, explained; beauty of the position of the Stamens and Pistils of this class; peculiar structure of the Anthers. 64, Stamens and Pistils of China Rose particularly beautiful. Orders of the class Monadelphia founded on the number of Stamens in each Flower. Class Diadelphia, or Two-brotherhoods, perfectly natural. Peculiar Structure of the Flowers belonging to it. 65, It's classic character difficult to be traced. Genus *Sophóra* separated from the Two-brotherhood Class, from it's Filaments not being united; the Orders founded on the number, only, of Stamens; each part of the Corol distinguished by different names. 66, Shape, &c. of these parts of use in marking the Généra, particularly the Calyx. Legume belongs to the Diadelphia Class of Plants. Distinction betwixt the Legume and Silique Seed-vessels.

Class

Class Polyadelphia, or Many-brotherhoods. St. John's Wort, a good Specimen of this Class. The Orders of Polyadelphia depend on the number of Anthers in each Flower. 67, Anthers and Stigmas the essential parts of the Stamens and Pistils.

LECTURE IV.

Examination of Flowers of different Classes. Classes 19, 20, 21, and 22, explained.

PAGE 68, Rules for the investigation of Flowers. Hippuris Vulgaris, remarkable for the simplicity of its structure. 69, Specimens of flowers belonging to different classes. 70, Deep divisions of the Stigma of Crocus make the order to which it should be referred doubtful to young Botanists; its Fructification cannot be accurately examined without taking the root out of the earth. Stamens of Plantago (Plantain), curiously folded within the Corol. 71, Difficulty of investigating the Umbel-bearing Plants. The terminating Flower of the Umbel determines the class to which the Flower belongs. Number of Stamens often varies in Flowers of the class Pentandria. More Flowers than one of the same Plant should be examined. 72, Umbelled Plants not proper subjects to begin with. Large Flowers of simple construction should be first examined. Specimens of Plants belonging to different classes. Class Enneándria (Nine Stamens) contains only six Génera. Only one British species of this class. 73, Lychnis Dioica puzzling to young Botanists, being placed in the class Ten Stamens; a defect in the system. Obviated by being noted for its want of Pistils. Lythrum subject to vary in its number of Stamens; necessity of examining many Flowers of the same genus. 74, Marks of the Twelfth and Thirteenth Classes. Specimens of different Classes and Orders, not depending on

the number of Stamens. 75, Seed-vessel of *Drába* (Whitlow Grass) a Silicle. Seed-vessel of *Hésperis* (Purple Rocket) a Silique. Many Plants of the class *Tetradynamia*, Four-powers, eaten, some without cookery; variety of eatable plants from the genus *Brássica*. Change produced in plants by the art of gardening an amusing part of the study of Botany. Specimens of the class *Monadelphia*, One brotherhood. Stamens firmly united at the base. 76, Systematic character of the class *Diadelphia*, Two-brotherhoods, shown in Pea. 77, Curious circumstance respecting the Pistil of Common Broom. 78, Specimen of the class *Polyadelphia* (Many brotherhoods). Stamens of *Hypericum* (St John's Wort) beautiful; the only British genus of the *Polyadelphia* class. The genus *Cítrus*, comprises Orange, Lemon, and Citron. Different appearance of their Stamens to those of *Hypericum*. 84, Explanation of the class *Syngénésia*, or United Anthers. Elasticity of the Filaments in the Flowers of this class; 79, consists of the Compound Flowers; natural, if a few *Génera* be excepted; this exception a fault in the system. What constitutes a Compound Flower. 80, Generic character founded, in part, on the variety in the form of the Corol. The first four Orders founded on the Stamen-bearing and Pistil bearing Florets. Mark of the Fifth Order. Sixth marked by the Corols being simple. 81, Perhaps, from this circumstance, ought to have been separated from the Class. Placed in it by their Anthers being united. Linneus does not pretend to make his Classes natural. Gratitude due to Linneus from all Botanists due also to his predecessors. Tournefort's system ingenious. Orders of the class United Anthers cannot be retained by the memory without examining flowers belonging to each. 82, Scabious has the appearance of a Compound Flower; belongs to the class *Tetrándria*, Four-stamens. Marked distinctions between them. 83, Scabious, a specimen of an Aggregate Flower. Specimens of the orders of the class United Anthers should be studied according to their orders. Florets of the Fourth Order having Stamens and Pistils not the only

only circumstance to be attended to. Having seeds or not, the essential character of the Fourth Order. Characters of the Orders. 84, Globe Thistle (*Echinops*). Difference in the Stigmas of Violet and Pansie. *Jasione* cannot belong to an order of Simple Flowers; it's Anthers united only at the base; does not agree exactly with the characters of the Compound Flowers, or those of the Aggregate. 85, Curious circumstance of the Calyx of Compound Flowers. 91, Elegant forms of those Compound Flowers which have their seeds furnished with a Pappus. 86, Extraordinary structure of the Flowers of the class Gynándria; it's essential character. The Pistil must be first attended to. Contains nine orders, founded on the number of Stamens. First Order natural. Structure of the Fructification explained. 87, Resemblance of the Flowers of the First Order to insects; fanciful names given them. Ophrys Genus contains several species resembling insects. Nectary, the principal feature in their different forms. Bee Ophrys. *Cypripedium* has it's name from it's resemblance to a slipper. 88, Structure of the parts of Fructification of *Arum* differs from that of all other known plants. Opinion of the younger Linneus respecting it. Plants growing commonly on the hedge-banks should be well understood. 89, Explanation of the class Monoecia, or One-house. Orders founded on the number, union, and situation, of the Stamens. Eleven orders of the class One-house. Names by which they are distinguished. 90, Essential character of the first twenty Classes. Description of the true Nutmeg, *Myristica*, first given by Dr. Thunberg. Class Dioecia, Two-houses, explained. Flowers of *Vallisneria* thought to be a strong argument for the sensation of plants. Hemp, *Cánnabis*, and Willow, *Salix*, belong to the class Two-houses; contains fifteen orders founded on the number, union, and situation, of the Stamens. Contradictions in the system of Linneus; 91, a removal of it's defects may be expected from the liberal spirit of the present age. Mistletoe, *Viscum Album*, a parasitical plant. Can be propagated only by one method; curious manner of the seed germinating.

ANALYSIS OF

LECTURE V.

Class Polygamia explained. Class Cryptogamia explained.

PAGE 95, Explanation of the class Polygamia. Many plants of this class dispersed into the classes Monoecia and Dioecia. 96, Difficulty of ascertaining by what manner the Anther-dust of the Fig, *Ficus Carica*, was conveyed to the Stigmas of the Pistils. Fruit of the Fig a Receptacle enclosing the Stamens and Pistils. Fertilization of it's seed supposed to be effected by the intervention of a Gnat. Process performed by it, termed Caprification; object of much attention to the inhabitants of those countries in which Figs make an article of trade. 97, Account of Caprification given by Mr. Milne. Objections against the necessity of Caprification. Receptacle of Figs gapes at top when the Stamens are mature, analogous, in this, to water-plants. Air, an element apparently necessary to the process of fertilizing seeds. Caprification esteemed by many authors a strong argument for the system of Linneus. First doubted of by the author of the Botanical Garden: his conjecture concerning it. 98, Apples wounded by worms ripen sooner than others which are not so. Fig-trees of Malta bear two crops in the same season; last crop ripened by Caprification. Figs of Provence and Paris ripen sooner by being wounded with a straw. Probable that the second crop of Figs in Malta ripens from being pierced. 99, Fig-trees cultivated in England produce two crops; latter crop pulled off by gardeners. Crop obtained by Caprification in Malta scanty, and not of good quality. The flowers of Fig to be looked for within the part which is eaten as fruit. Inside of a Fig beautiful. Anther-dust may be seen in the Figs cultivated in England, if opened when they gape at top. 100, Class Cryptogamia explained; consists of four orders. The system of Linneus may have retarded a more distinct knowledge of this class. Definition of Ferns.

Ferns. 101, Leaf of Fern termed by Linneus a Frond. Curious mechanism of the seed of Ferns. Sago Powder made from the pith of a species of Fern. Vegetable Lamb, a species of Fern; marvellous stories from want of proper investigation. 102, Glove and Stocking-tree in Caffraria. Confusion arising from too great credulity; facts should be reasoned upon before they are assented to. Root of Common Fern (*Pteris Aquilina*) used for bread in New Zealand. Bread made from a species of Fern in the Canary Islands. Second Order of Cryptogamia contains the Mosses, Musci; circumstances from which the *Génera* are marked. 103, Their seeds have no Cotylédons. Linneus doubted whether what he termed the Anthers were really so. Dillenius the first who attempted the arrangement of the Mosses. Many curious circumstances belonging to the tribe of Mosses; recover their verdure on being moistened, after having been long dried. Fructification of the Algæ, Flags, too obscure to admit of precise arrangement; two divisions of them. Terrestrial and Aquatic, their *Génera* distinguished by the outer structure. Many curious and useful Vegetables among the Algæ. Lichen Rangiferinus, or Rein Deer Lichen, it's use to the inhabitants of northern climates. 104, Different species of Lichen used in dying. A species of *Ulva* used for food by the Japanese; some kinds used for pickles in England. 105, Curious structure of some of the Aquatic Algæ. *Conferva Ægagrópila*, *Vagabunda*, and *Fucus Natans*, itinerant vegetables. *Byffus Flos-aquæ*, floats on the sea all day and sinks at night. *Conferva Polymórpha*, lines upon it in the Botanic Garden; 106, grows on the British shores. Last Order of Cryptogamia consists of the Funguses, Fungi, divided by Linneus after the method of Dillenius. Method of Dillenius explained. Fungus tribe divided into ten *Génera*. Funguses produced from seed; 107, their species constant; renewed by uniform laws; little known of this part of the vegetable creation. Much attended to in these times. Mr. Curtis's investigations valuable on this subject. Late discoveries of the production of animals may lead, by analogy, to the

the knowledge of the reproduction of vegetables. Curious facts of the Polypi genus; 108, Experiments of Monsieur Trembley. Hydra, the Linnean name of the Polypi genus. Reproduction of Plants from Strings and Suckers, similar to the increase of Polypi. Information to be gained of the class Cryptogamia very small. Parts of Fructification not only to be considered. Experiments founded on analogy may lead to important discoveries. Small progress made from those which presupposed a Fructification. 109, Beauty of the Cryptogamia Plants in winter. Extraordinary structure of *Lycoperdon Fornicatum*. Appendix of Linneus. Plants contained in it arranged under the general head of Palms. Singular structure of these plants. Their leaves resemble those of Ferns. Termed Fronds; their Fructification produced on a Spadix. 110, Terms Spathe and Spadix originally applied to Palms only, now used for other plants, whose flowers are protruded from a Sheath. Cocoa nut, *Cocos Nucifera*, and Date-tree, *Phoenix Dactylifera*, Palms. Anther-dust of Date-tree, and Pistacia, said to retain its virtues more than a year. Great height of *Corypha Umbraculifera*. Erroneously named Cabbage-tree. True Cabbage Palm, *Aréca Oleracea*. 111, Used by the inhabitants of the West Indies as a rarity; sent pickled to Europe as such. Cutting away the Cabbage shoot destroys the tree. 112, Cabbage obtained from most of the Palms. Breadfruit-tree, *Artocarpus Communis*, of Forster. 113, Has born fruit in Jamaica. Disappointment of Dr. Thunberg, in his attempt twenty years ago, to bring Breadfruit-trees from Ceylon into Europe. The fruit made use of in cookery by the rich inhabitants of Ceylon. Fifteen different dishes prepared from it in Ceylon. The fruit of extensive benefit to the poor. Make use of it as the poor of England do of potatoes. Used by the natives of Otaheite in a simple manner. 114, Two kinds found in Ceylon; the least sort without seeds, the larger produces great numbers of seeds; size of the seeds. Several varieties of the *Artocarpus* in the South-Sea isles, all without seeds; this deficiency attributed by Mr. Forster

Forster to the effects of cultivation. The Breadfruit-tree of Ceylon supposed to be of the same genus with that of Otaheite. Seeds of the Breadfruit-tree of great value; eaten by the rich; prepared in different ways; eaten plain roasted by the poor; simple manner in which the Breadfruit is used by the poor inhabitants of Ceylon. 115, The trees flourish whole centuries; bear fruit on their Stems. The fruit used for food in three different states of maturity; when quite ripe eaten in it's fresh state. Plaintain-tree, *Musa Paradisiaca*, and Banana, *Musa Sapientum*, called Bread-trees in the West Indies. Cultivated in Jamaica for the use of the negroes; found in the South-Sea isles. Banana loses it's seeds by cultivation. 116, Leaves of Banana made use of for shade in warm climates. Cocoa-nut-tree deserves a place in the first rank amongst the vegetables which are useful to mankind. Leaves of *Borassus Flabelliformis*, and *Licuála Spinosa*, used by the inhabitants of Ceylon, in the state in which they grow, for writing upon. Ingenious method of writing upon them; books made of them. Leaves of *Licuála* used for umbrellas; six persons may be sheltered by one of these leaves. 117, Natural Orders, attempted by Linneus, placed at the end of the *Génera Plantárum*. Natural method attempted by many Botanists not without success. Merit of artificial systems generally allowed. Opinion of Linneus concerning natural systems. Fifty-eight natural Orders of Linneus. 118, These Orders well explained in Mr. Milne's Botanical Dictionary. Artificial system must first be learnt. Order in which a young Botanist ought to proceed.

ANALYSIS

OF THE

SECOND PART.

LECTURE I.

Génera of Plants.

PAGE 119, *Génera of Plants*, the Third Division of the System; the term Genus explained. 120, Botanical Alphabet of Linneus. Receptacle of the Fructification explained. 121, Receptacle of the Flower and of the Fruit explained; made use of in the *Génera Plantarum* only when it forms a Character of the Genus. Botanical Alphabet, or 26 Marks, taken from the parts of Fructification. Essential Characters. 122, Language of the translated System of Vegetables excellent. *Canna* and *Hippúris* proper plants for examination; manner of referring them to their Genus. 123, Terms *above* and *beneath* explained. Manner of referring a plant to its Genus continued. Departure from the general rule of the System always noted by Linneus. 124, Generic Characters of *Canna*. *Hippúris* easy to be referred to its Genus; merit of the Linnean method. 125, Honeyfuckle referred to its Genus. Distinguished from *Triósteum* by the form of the Stigma. 126, Specific distinctions of *Lonicéra*; remarks on the species in the *Génera Plantarum*. 127, *Species Plantarum* not translated. Wonderful ingenuity of the System of Vegetables. *Iris* a perplexing flower to the young Botanist; should be referred to its

it's Genus in the manner recommended in Canna and Lonicéra. Essential Character of Iris; description of it. 128, Different kinds of Nectaries found in Iris. Variety in the form of the Capsules. Distinctive marks of Généra noted. Marks from colour, smell, and taste, of Plants rejected by Linneus as being too inconstant; 129, dimensions and place of growth not admitted, from their uncertainty; not without their use. Nectaries of importance in the Généric Character. Orders of the class Monadélphia. Marks of discrimination of the Généra. 130, Arrangement of the genus Geranium by Linneus. L'Heritier's improvement of the Geranium family; his arrangement explained. Doubts respecting the classical mark of Geranium. 131, Four species of British Geranium removed to the genus Eródium. Dr. Smith's improvement of the specific distinctions of Geranium. His English Botany. Marks of the Orders of the class Syngenésia, United Anthers. 132, Artichoke referred to it's Genus. Beauty of the Pappus. Dandelion referred to it's Genus. 133, Essential Characters of Dandelion. Pappus of Dandelion. Distinction of the terms *plumy* and *hairy*. Dandelion deficient in one of the essential characters of it's Genus. Deviation of different species of Leóntodon from the marks of their family. 134, Plumy Pappus in Tragopogon. Hairy Pappus of Artichoke. Distinction of the Pappus of great importance. Method of discerning the distinction. Scopoli's opinion of the deficiency in the plumy Pappus in Dandelion. Obvious characteristic distinctions of the Compound Flowers. 135, Mr. Curtis's discoveries of different marks in these flowers. Smaller flowers of the class Syngenésia less easy of investigation than the larger kinds. Umbelled plants. Mode in which they should be investigated. 136, Characters of the subdivisions of the order Digynia of the class Pentándria. Explanation of various terms used in the characters of the Umbelled Tribe. Explanation of the same terms applied to the Compound Flowers. 137, Terms *uniform* and *not uniform*, explained. Form of the Seeds of consequence in the specific character of Umbelled Flowers. The Radiate

Radiate Flower shown in *Scandix Pecten*, Shepherd's Needle, 138, Disk and Ray explained. Difference in the species of *Gentiana*. Centaury removed to the genus *Chironia*. The accurate observations of Mr. Curtis. His candid criticisms of the works of Linneus.

LECTURE II.

Nectaries of Plants.

PAGE 140, Extraordinary appearance of the Stamens of *Houeleek* explained by Mr. Curtis. 141, Advantage of examining flowers in different states of maturity. Distinction betwixt *Sempervivum* and *Sedum*. Genus *Euphorbia* accurately described by Mr. Curtis. Linnean characters of *Euphorbia* defective. 142, Investigation of *Euphorbia*, on the Linnean principles, extremely difficult; a distinct idea may be attained of the Genus by the dissection of some of the larger species. The part, called by Linneus, the Corol, Mr. Curtis names the Nectary. Singular appendage of the Seeds of *Euphorbia*, taken notice of by Mr. Curtis. 143, Definition of the term Nectary. Honey profuse in the flowers of the *Arbutus Unedo*; found at the base of the petals of Papilionaceous flowers. Clover contains much honey. Chief distinctions of those Nectaries, which adhere to the parts of Fructification. 144, Nectary of *Fritillaria*, most obvious in the species *Imperialis*, Crown-imperial. Different kinds of Nectary. Nectary, the term applied by Linneus, to every singularity of Fructification, which cannot be reduced under the seven regular parts of a flower. 145, Nectary, as a separate appendage, not found in all flowers. All flowers believed, by Linneus, to contain honey. Nectaries distinguished, by Linneus, into two kinds. The tube of the Florets of Compound Flowers contains honey. Nectary only noticed by Linneus when it characterizes a Genus. 146, The tube of One-petalled Flowers.

Flowers termed, by Linneus, a true Nectary; he calls the filaments of *Fraxinella*, Nectar-bearing. Resinous matter on the filaments not of the nature of honey; similar to that with which the stalks abound. Nectaries placed apart from the Fructification; the structure of them merits the strictest attention. 147, Nectaries of *Colombine* resemble the parts of a bird. Beauty of the Nectaries of *Helléborus* and *Parnassia*; Globules not the true Nectaries. The base of the petals of *Pinks* sweetish. The base of the Calyx replete with honey. Difficult to determine by what part of Fructification the honey is secreted. Beautiful structure of the Nectary of *Mignonette*. 148, Structure of *Passiflora*. Nectaries form the principal feature in the Genus *Passiflora*; in some species resemble a bread-basket. 149, Linnean description of *Passiflora* not just. Difficulty of attaining a distinct idea of the *Gynándria* class. Extraordinary structure of Fructification peculiar to the *Orchis* tribe. 150, *Orchis* flower dissected. Twisted Germe of *Orchis*; curious structure of the Stamens, and the cases by which they are contained; may be drawn out of their cases by the most gentle touch. Globule at the base of each Stamen. Anthers composed of Corpuscles; same effect, probably, produced by them as by Anther-dust. Seed of *Orchis* apparently perfect. 151, Smallness of seed no argument against it's vegetating. Ferns propagated from seed. *Orchises* not yet decidedly so; increase sparingly by the root. Patience and impartiality requisite to make experiments. 152, Early Purple *Orchis* obviously distinguished by it's spotted leaves, and brilliant flowers. *Orchis Mório* appears under many varieties; marked through all it's varieties by the green lines on the two outermost petals; Anthers green. Ten distinct species of British *Orchis*. Different *Génera* of the *Orchis*-like plants distinguished by their Nectaries. Bee-orchis an *Ophrys*. 153, Characters of the *Ophrys* Genus should be examined with magnified drawings. Different structure of *Orchis* and *Ophrys*. The character of several species taken from the Nectary. Leaves of *Ophrys Apífera*, and *Ophrys*

Ovata, differ materially from the leaves of the Orchis Genus. Roots of Ophrys Apífera resemble those of Orchis. Roots of Ophrys Ovata fibrous. Supposed error in the character of the seed-vessels of Orchis, Satyrium, Ophrys, and Serápias.

LECTURE III.

Génera of the Classes One-house and Two-houses. Of Ferns.

PAGE 157, Arum, a plant of extraordinary structure. Nature not limited in her modes of reproduction. 158, Singular situation of the stamens of Arum, respecting the Pistil. Stamens a collection of Anthers only. Nectaries of Arum. Seeds of Arum. Opinion of the younger Linneus of the classic character of Arum. 159, Roots of common Arum extremely acrid; eaten by thrushes; the roots of some species made use of as food; the leaves of some species boiled and eaten. Starch made from the roots of Arum Maculatum; injurious to the hands which use it. All parts of the plant acrid. The leaves and whole structure of Hydrócharis exceedingly curious. 160, Singularities of the stamens explained. Nectaries observed, by Mr. Curtis, on the pistil, not noticed by Linneus. Spathes of the flowers of Hydrócharis appear full of bubbles. Mr. Curtis's account of Hydrócharis differs from that of Linneus. 161, Flowers of Typha, or Cat's-tail, difficult of investigation. Mr. Curtis does not wholly agree, in his account of them, with Linneus. Mr. Curtis's account to be relied on. Flowers of Typha described. Supposed calyx, of Linneus, hairs which cover the receptacle after the stamens are fallen off. Spikes of flowers Aments, or Catkins. Cylindric form of the spikes marks the Genus Typha. *Culm*, the Linnean term for the straw of Grasses. 162, Difference of position of the male and female flowers on the *Culm*. Magnificent appearance

pearance of the flowers of *Typha Major*; every part of the plant worthy of attention. Species of *Cárex* not easily distinguished from each other. *Cárex Péndula* distinctly marked by the long pendant Aments of it's flowers. The Catkin tribe of flowers merits attentive examination; manner of investigating Ament-bearing plants. 163, *Cryptogámia* class. Stamens and pistils not yet discovered in the *Cryptogámia* class. Meaning of the term Fructification, as applied to the plants of *Cryptogámia*. The *Fílices*, or Ferns, divided into three sections, by the disposition of their fructifications. Radical Fructification explained, well seen in *Pilulária*. Hedwig's botanical researches, in class *Cryptogámia*, of great importance. 164, *Equisétum Sylvaticum*, a good specimen of the spiked fructification of Ferns. Extraordinary appearance of the supposed seeds of *Equisétum*; magnified drawings a great assistance in the investigation of obscure plants. Plates not wholly to be relied on. Little progress made in any study by those who rely on the authority of others. The rule "See for yourself," to be observed in all studies; Mr. Curtis's works rendered valuable by the observance of this rule. 165, His candid correction of the few errors of Linneus, of essential service to the botanical world. Account of the progress of *Equisétum*. Greenish powdery mass shook from the spike. Particles of powder appear regular formed bodies, viewed in the microscope; account of their form. Regular organization of the parts of plants. Curious appearance of the powder shook from the spikes of *Equisétum*. 166, Hedwig's opinion of this powder; circumstance in favour of his opinion. Scales of the protruded spike of *Equisétum*, protected the spikes before protrusion. 167, Knowledge of the fructification of *Equisétum* leads to the knowledge of the Fructification of other spiked Ferns. Leafy Fructification: beauty of the maiden hair. The parts of Fructification too minute for the investigation of young Botanists. 168, The larger size of Hart's-tongue, shows the Fructification distinctly. Fructification described; wonderful mechanism of the seeds, with their apparatus. Benevolence of

nature in all her works. Mechanism of the Capsules of Fern. 169, Difficulty of viewing the Capsules of Fern through a microscope. Capsules opened by the warmth of the breath. Have the appearance of being alive; dextrous management, and patience required in viewing them. Root of Polypodium Vulgare resembles the large kind of caterpillars. 170, Errour in the description of Polypodium Vulgare by eminent Botanists; ascribed by Mr. Curtis to too great deference to authority. Errour of Tournefort in delineating the Capsules of the Polypodium Genus without rings; one of the many instances of the fallacy of authority. 171, Polypodium Vulgare appears destitute of the membrane by which the Capsules of all the other species are enclosed. The Fern tribe opens an ample field of discovery to modern Botanists. Practice can alone make us acquainted with the different Généra of Ferns. Similarity of their Fructifications. Capsules variously placed on the Fronds; precise generic character not easily ascertained. 172, Plates and remarks of Mr. Curtis, in his London Flora, particularly useful in the study of Ferns.

LECTURE IV.

Mosses, Flags, and Funguses.

PAGE 177, Mosses, a tribe of plants little understood; beauty and use of Mosses. The opinion that they impoverish the ground on which they grow, erroneous. Roots of Mosses penetrate but a little way into the earth. 178, Resemble Ever-greens. Fuel, called Peat, formed from the roots of Moss. Peat-fuel not exclusively derived from Moss. 179, Whole trees enter into the composition of a Peat-bed. Moss retains moisture a long time, without becoming putrid; it's use to gardeners. The distinct Fructifications of Mosses well established since

Since the time of Linneus, their situation not yet determined. A revival of the works of Linneus desirable. Class Cryptogamia improved since his time. Généra of Mosses distinguished by their outer habits, and situation of their Capsules. Resemblance of Mosses to the Pine tribe; 180, slowness of their growth. Difference in the leaves of Mosses. Male and female flowers placed separately. Calyx, termed by Linneus Calypstre. From the presence or absence of the Calypstre Linneus has distinguished the Généra. Opérculum of Mosses, a curious microscopic object; should be examined with magnified drawings. 181, Parts of the Fructification of Mosses may be seen, in an early state, with the assistance of glasses. Hedwig's discovery of the difference betwixt the leaves of the plant, and those which form the fructification buds; esteems the bud-leaves true involúces; increase in size as the capsules grow towards maturity. Hedwig's researches promise great information on the subject of Mosses. 182, His plates not of much use to young Botanists. Mr. Curtis's figures and descriptions accurate and plain. Mr. Curtis does not venture to decide whether the powder contained in the Capsules of Mosses is Anther-dust or Seed. Hedwig asserts that the Capsules are true Seed-vessels. Young Plants raised from the Capsules of Mosses, by Hedwig; sowed, by Dillenius, without success. Cause from which these different results of the same experiment may have arisen. Description of Curled Bryum. 183, Hedwig's observation upon the expansion and contraction of the Fringe of the Capsule in dry and moist air; closes, even from the moisture of the breath. Curious mechanism of the Capsule of Mosses; contents of the Capsule protected by the fringe found under the Calypstre. Calypstre of Bryum Undulatum described. 184, Mechanism of the supposed Fructifications of Mosses and Ferns equally curious; both seem formed for the protection and dispersion of their seeds; the manner in which the seed is produced unknown, unless Hedwig's researches may be relied on. Magnified leaf of Bryum Undulatum shows it's undulated edges. Bryum Undulatum

produces it's Capsules from November to February; situations in which it is found. The leaves curl up soon after the plant is gathered. A species of *Bryum* placed by Linneus among the *Mniums*; distinguishable from *Undulatum* by it's bending peduncles. 185, Star-like appearance on Mosses supposed, by some authors, to be the pistil-bearing parts of Fructification. Various opinions respecting these Stars; conjecture respecting these Stars. An outline of the opinions of eminent Botanists on the class *Cryptogamia* should be given to botanical pupils; admits only of conjecture. The part, termed Anthers by Linneus, now known by the name of Capsule. 186, Singular structure of the leaves of *Hypnum Proliferum*, found by Linneus under the shade of thick woods. Rare appearance of Fructification in *Hypnum Proliferum*. Time of fructifying, from December to February. 187, Structure of Capsules nearly the same in all the Mosses. Peculiarities, discovered by Mr. Curtis, in the Capsules of *Bryum Subulatum* and *Polytrichum Subrotundum*. The use of these peculiarities not understood. Great nicety requisite in making experiments. 188, Curious and beautiful structure of the Capsules of *Polytrichum Subrotundum* discovered to be a constant mark of the Genus. Structure of the Capsules described. 189, London Flora a work too expensive for general use. Dr. Smith's English Botany recommended. 190, The Root, Stem, and Leaf of *Algæ* scarcely admit of distinction. Destitute of obvious Flowers; manner of distinguishing the *Génera*. *Algæ* of great importance in the economy of Nature; vegetate upon the barest rocks. *Lichen Pascalis* found by Dr. Smith on a torrent of hardened lava; peculiarly fitted for the beginning of vegetation on a hard surface. Thread-form Lichens insinuate their roots into crevices of the barks of trees. 191, Crustaceous kinds vegetate on smooth surfaces. Process of Nature in forming vegetable mould apparent upon the smooth and barren rocks upon the sea-shore; account of the process. Lichens made use of in dying; fed upon by goats and reindeer. 192, Cup-moss, a Lichen. Numerous species of Lichen difficult

Difficult to distinguish. Hedwig's investigations of them; his opinion of their parts of Fructification. Fringes from Lichen Ciliaris put forth roots; distinct from the supposed parts of Fructification. Hedwig's plates of the Algæ tribe. Algæ not well understood. Sea-wrack, a Fucus. 193, Prolific property of the leaves of Fucus Vesiculofus. Black hair-like tufts found growing upon Fucus, a Conferva. Some species of Fucus, perhaps not true vegetables. Sea-anemone falsely esteemed a vegetable. Green films on water and on trees not thoroughly understood. Class Cryptogamia requires new arrangement. 194, Génera of the third order distinguished by no obvious common character; peculiarities of them worth attending to. Beauty of the Lichens. White Moss, on heaths, Rein-deer Lichen; many varieties of it; distinction between them and the true species. 195, Moss on trees, a Lichen. Lichens, Mosses, Ferns, and Funguses, form a complete winter garden. Funguses should be studied with good plates. Generality of Funguses not offensive either to the smell or taste. Much information gained, concerning them, within the last twenty years; not yet perfectly understood. 196, Hedwig's researches into the Fungi tribe; supposed, by him, to possess stamens and pistils. Curtain of Funguses, not found in every species. Curtain described. Hedwig's account of the supposed pistils. 197, Seeds of Fungi. Globules uniformly found in the Génera Agaricus and Bolétus believed, by Hedwig, to be stamens. Parts which can be seen only with powerful magnifiers cannot be used for the distinction of Génera. 198, Excellence of generic characters to be obvious and clear. Fungi continue their species by a powder which is visible in the gills of many of them, generally allowed to be seed. Short continuance of some of the Agaric species. Investigation of an Agaric. Genus Agaricus described. Three first divisions of the Genus founded on the position of the stipes. 199, Distinction betwixt the Volve and Curtain, explained by Mr. Bolton. Erroneous account of the Volve, by Linneus. Under the Curtain of Fungi the parts of Fructification found, by

Hedwig. Ring of Funguses formed from the remnants of the Curtain. Ring uncertain in its appearance; cannot be used for a permanent mark. Stem of *Agáricus* either solid or hollow; varies much in its degree of solidity. 200, Colour of the gills varies in different species; vary much in their respective lengths. Seeds formed between the membranes of the Gills. Situation of the Gills. Peculiarity of structure discovered, by Mr. Curtis, in the Gills of *Agáricus Ovátus*; use of that structure. Secondary subdivisions of the Agarics, on what founded. 201, Gills a part of great importance; various appearance of the Gills; colour of the Gills not liable to vary. Character of the species taken from the colour and structure of the Gills. Colour changes when the plant begins to decay; colour must be observed in their first state of expansion; colour of the flat side of the Gills, that which must be attended to. 202, Hat of the Agarics, the part least to be depended on. Viscous juice of the Hat depends on the state of the atmosphere. Acrid juice in Agarics, not constant. Dr. Withering's arrangement of the Fungi. 203, Exception to the uniformity of colour in the Gills in *Agáricus Aurántius*. Beautiful colours of the Agarics. *Agáricus Cæsareus* the most splendid of the Agarics; a rare plant in Britain, common in Italy. *Agáricus Campéstris*, the Fungus most commonly eaten in England; method of propagating it. Caprice of mankind in their choice and rejection of food. 204, All kinds of Fungi used for food by the Russians. Doubtful whether the common Mushroom be poisonous. Many vegetables rendered wholesome by fire. 205, Necessitous situation of the inhabitants of northern climates. Make use of the inner bark of the *Pinus Sylvéstris* for food. Method of preparing it for bread. Swine fattened upon pine-bark bread. 206, Numerous tribes of insects sustained by the Fungi. Extensive use of the *Pinus Sylvéstris*, Scotch Fir; roots of Scotch Fir used in the Scotch Highlands for candles. Ropes made by fishermen of the inner bark. 207, *Pinus Sylvéstris* the only species of Fir which grows naturally in Scotland. Oil extracted from the

cones of Scotch Fir; lives to a great age; profuse in Anther-dust. Mould a regular plant; its parts distinctly seen through a microscope. 208, Thirteen different species of the *Múcor* Genus. Golden *Múcor*, stains the fingers yellow, when touched; commonly found on the Genus *Bolétus*; repels moisture.

LECTURE V.

On the Grasses.

PAGE 211, The Grass tribe requires a particular mode of investigation. Vague idea conveyed by the vulgar term Grass. Grasses imperfectly understood until late years. Names by which they have been distinguished not in general use; 212, subject greatly elucidated by Mr. Curtis; his Practical Observations on British Grasses; useful knowledge to be acquired from that work. Grasses form one of the natural orders of Linneus. Corn arranged under the same order. Similarity in the parts of Fructification of Grasses. Striking agreement in their outer habits. Whole class characterized by simplicity of structure. 213, Seed of Grass does not divide into lobes when it germinates; termed, by Linneus, *One-cotylédoned*; the hulk of the seed may be seen adhering to the fibres of the young plants of wheat. 214, Peculiarities of Grasses shown in *Alopecúrus Praténse*, Meadow Fox-tail; better seen in the plant than in plates. London Flora amusing and informing on Grasses. Leaves and sheaths of Grasses often furnished with bristles. 215, Specific characters taken from the presence or absence of bristles. Parts of Fructification not noticed by common observers. Beauty and structure of those parts worthy of the highest admiration. Natural character of the flower of Grasses. Arista of Grasses. Awn of barley particularly strong; not constant in every species. Corol

Corol of Grasses termed *Glume*. Divisions of the outer Glume often mark the Genus. Difficulty of distinguishing the Calyx from the Corol. Calyx and Corol to be understood according to the definition of Linneus. Nectary of Grasses distinctly shown in Mr. Curtis's plates; 216, not difficult to be seen in the natural flower. May be seen at the base of the Germe in Wall Barley; nearly resembles the Corol; furnishes no generic distinction. Three stamens, the number commonly found in Grasses. Two pistils. Exceptions to this number. Styles beautiful; seen with advantage through a microscope. 217, Close-spiked Grasses do not show their Fructification well. Seen well in Feather-grass. Should be examined before the Anthers have discharged their dust. The flowers of Grasses have no seed-vessels. Seeds emitted from the Calyx in various ways. Seeds of Feather-grass dispersed by the twisting of their Awns. Receptacle of Grasses. The Stem lengthened out. Awns of Feather-grass twist after they have been gathered. 218, The parts of Fructification obvious in Quake-grass, *Briza Máxima*. Characters of Fructification nearly constant in Grasses of the Triándria class. Strict adherence of Linneus to the classic character of Grasses. *Hólcus Lanátus* placed in the class Polygamia. 219, Greatness of the works of Linneus a just excuse for the few errors contained in them. Variation of the number of stamens not uncommon in several species of Grass. Strict adherence to the classic character perhaps advantageous in an arbitrary system. *Anthoxáanthum* judiciously placed in the class Diándria from its constant number of two-stamens. 220, Peculiarities in the Fructification. 221, Fragrant scent of hay derived from the leaves of *Anthoxáanthum*; not the only English Grass which is fragrant. 222, Flowers of annual *Póa* said to be so by Mr. Swayne. *Anthoxáanthum*, viviparous; many Alpine Grasses viviparous. Canary birds fed on the seeds of *Phálaris Canariénsis*. Ribbon-grass, a species of *Phálaris*. Genus *Avéna*, marked by the twisted awn on the back of the corol. 223, Motion of *Avéna* *Fatua*. Named Animated Oat. Curious circumstance respecting

ing the seed of barley. Automaton ingeniously made on the principles of the awn of barley. Wheat the most nutritive of the grains used for food; found in most parts of Europe and of Asia. 224, Zéa, Indian Wheat, the product of the torrid zone. Rice of the natural order of Grasses; separated from them in the artificial system of Linneus; chief food of the inhabitants of most eastern climates; converted into poison by the spirit extracted from it. Extensive utility of the natural order of Grasses; their roots not destroyed by being trampled upon. The Flowers of plants not eaten by cattle. 225, Admirable provision made by Nature for the preservation of Grasses.

LECTURE VI.

Specific Distinctions and Double Flowers.

PAGE 227, Linneus first began to form essential specific distinctions of plants. Confusion arising from the want of such distinctions. Specific distinctions of Linneus. 228, Trivial name, given by him, generally arbitrary; resembles the name given to the individuals of a family; advantage of such names in preference to descriptive names. Confusion arising from the neglect of the use of proper names. Perfection of Nomenclature may be hoped for. 229, Great advantage of the use of the proper names and the terms of science. Excellence of the language of the Lichfield translation of the System of Vegetables. Awkwardness of forming English trivial names. Such names injurious to the science of Botany; 230, defended only by superficial Botanists. Specific characters not to be formed from variable circumstances. Colour one of the least permanent characters. 231, Departure of Linneus from his own rule. Roots of plants a true specific mark.
Difficulty

Difficulty of examining the root prevents it being made use of as such. Trunk and Stalk afford strongly marked characters. Fulcra and Inflorescence furnish permanent marks. Parts of Fructification sometimes used with advantage in specific distinctions. 232, Some *Hypéricums* and *Gentians* distinguished by their parts of Fructification. Such distinctions agreeable from being obvious. Many other specific characters equally obvious. Study of leaves necessary to the understanding the species of plants. Most elegant specific distinctions formed from leaves. Great variety in leaves; must be attentively studied; method of studying leaves. 233, Form of leaves first to be considered; divided into simple and compound; simple leaf defined; sixty-two ways in which a simple leaf may be diversified. Various forms of leaves must be studied with plates of them, and terms of explanation. Genius of Linneus shown in the construction of his botanical language. English Botanists much indebted to the Lichfield translators of Linneus's works. Preface and advertisement to the Lichfield translation should be read by botanical pupils. The knowledge of leaves may be acquired by attention. 234, Explanation of the Linnean language. Excellence of the Linnean descriptions. Want of precision in the descriptions of other authors. Method of acquiring precise ideas of the different forms of leaves. 235, Language of the Lichfield translators explained; agreeable conciseness of that language. 236, Compound leaf defined. Compound leaf and branch known from each other by two rules. 237, Leaves of *Robinia Pseud-acacia*, a good example of the compound character. Three kind of compound leaves. Great variety of compound leaves. Each modification of a compound leaf marked by an appropriate term; method of studying compound leaves. Different modifications of the compound leaf enumerated. Fingered leaf seen in *Horse-chestnut* and *Lupine*. Specific characters frequently formed from the various modes of compound leaves. 238, Various forms of simple leaves should be studied before those of the compound kind are attended to. The Lichfield translation
the

the only book from which an English Botanist can completely learn the science of Botany. Determination of leaves explained. Belongs to simple and compound leaves equally. *Alternate* leaves shown in Ivy-toad flax. 239, *Opposite* leaves, in Myrtle. Manner of leaves being placed on the stem common to the whole Genus. *Direction* of leaves explained. Various modes of direction must be studied. *Insertion*, a general term for the manner in which leaves are attached to plants. Each mode has an appropriate term; these terms well explained in the System of Vegetables. Double flowers, some knowledge of them requisite for young Botanists. 240, Double flowers, the pride of florists, the product of culture. Vulgar error of gardeners respecting double flowers. Completely double flowers lose their stamens. Various modes of vegetable monsters being produced. Calyx and lower row of petals unchangeable in double flowers. Half-double flowers bear fruit. 241, Hose-in-hose Polyánthos, a proliferous flower. Hen-and-chicken Daïsie, a beautiful vegetable monster. Extraordinary change caused in Rose Plantain, by becoming double. Flowers multiply by their nectaries; become double in various ways. Provence Rose destitute of stamens. Damask Rose does not lose it's stamens by becoming double. Many-petalled flowers most liable to become double. One-petalled flowers rarely multiplied beyond a double corol. Beauty of compound flowers increased by multiplying. Single flowers generally more beautiful than double ones. 242, Various causes from which plants depart from their true species; culture the most prevailing cause. Fruits and esculent vegetables derive their excellence from the art of gardening. Culture the best test of a true species. Ingenuity and industry of mankind conspicuous in the culture of corn. Botanists should attend to distinctions arising from seedling varieties. Varieties of plants not noticed in the System of Vegetables, marked in the Species Plantarum with a capital B. Leaves subject to all the varieties which take place in flowers; 243, undergo extraordinary changes in their appearance. Many changes in leaves may be effected by art.

NOTE,

NOTE.

IN the pronunciation of the names of plants, *e*, at the end of Latin and Greek words is always pronounced, and not sunk as in English. Thus, Agáve, is pronounced A-gá-ve; and Acre, A-kre.

Cz in these languages is pronounced like *k* in the English. Thus, Achilléa is pronounced as if it were spelt A-kil-le-a; and Chelóne, as if it were spelt Ke-lo-ne. In words ending in *ides*, the *i* is always to be pronounced long. In words beginning with *ſce* and *ſci*, the *c* is generally pronounced soft. In words from the Greek, the *g* should be pronounced hard, as in Syngenéſia and Storgé.

BOTANICAL LECTURES.

PART THE FIRST.

LECTURE I.

The Seven Parts of Fructification explained.

LINNEUS, the great swedish naturalist, has divided the vegetable world into 24 *classes*; these *classes* into about 120 *ORDERS*; these *orders* contain about 2000 *families*; and these *families* about 20,000 *species*, beside the innumerable varieties, which the accidents of climate or cultivation have added to these *species*. The system of Linneus is called the sexual system of botany, from being founded on observations, which seem to prove, that there are males and females in the vegetable world, as well as in the animal. The stamens are termed males, and the pistils females: these most frequently exist in the same flower,

B

but

but are sometimes in different flowers, and sometimes even on different plants; and from their number, situation, and other circumstances belonging to them, he has formed his *classes* and ORDERS; his *families*, or *genera*, are formed from all the parts of the blossom or fructification; his SPECIES, which are individuals of the families, from the leaves of the plant; the varietics, from any accidental circumstance of colour, taste, or odour: the seeds of these varieties do not always produce plants similar to the parent, but frequently such as resemble that species to which the parent belonged. Having given a sketch of the philosophy of the system, the next thing to proceed to is the examination of the different parts of a blossom, or, according to Linneus, the fructification. Nor is a knowledge of any other than the english tongue necessary to the acquirement of the language of botany: the latin pupil may know that the word calyx signifies cup, but that will not assist him in the knowledge of the various species of calyxes which he will have to retain in his memory; the common meaning of words is not sufficiently precise for the purpose of science, and cup and calyx require equal explanation when

when appropriated to the particular parts of a flower. The works of Linneus being now translated, botany has a language peculiar to itself; that language is, perhaps, somewhat less difficult to learn than any other language; and should tenfold the difficulty be found in the acquirement of it, the time might be esteemed well spent.

The term fructification is defined by Linneus to be a temporary part of vegetables dedicated to germination; that is, all the parts of the blossom, which are intended for the production and preservation of the seed, and which, having brought that to perfection, wither and fall off. All these parts, however, are not essential to the production of perfect seed, as will be seen hereafter; nor are all these parts present in every flower. There are *seven parts of fructification*. 1st, the *calyx*; 2d, the *corol*; 3d, the *stamen*; 4th, the *pistil*; 5th, the *pericarp*; 6th, the *seed*; 7th, the *receptacle*. The *calyx* is the termination of the outward bark of a plant; of it there are seven kinds; it generally appears in the form of a green cup; its chief use is to enclose, support, and protect the other parts of the fructification. The first and most common kind of calyx is the Perianth,

and is placed immediately under the flower, which is enclosed in it, as in a cup; primroses (*primula*) and roses (*rosa*) have their calyxes of the Perianth kind. 2d, Invólucres, which is a calyx, growing at a distance from the flower. Most flowers which have Invólucres have also Perianths, as the *primula* genus. Those slender leaves, which grow at the base of the numerous flower-stems of the polyanthos (which is a *primula*) are termed Invólucres; the same in meadia dodecátheon, in parsley, apium, and all that tribe of plants which is termed umbelled. The plant called fool's parsley, *æthúsa*, by eating of which, mistaking it for garden parsley, some persons have been said to be poisoned, may be distinguished from all other umbelled plants by the Involucres, which belong to the small umbels, and which consist of three long, narrow, pendulous leaves, placed at the bottom of each umbel: these leaves are called partial Involucres; those which grow at the base of the whole collection of umbels form what is termed the general Invólucres. 3d, Glume chiefly belongs to grasses, and consists of one, two, three, or more valves, folding over each other like scales, and frequently terminated by a long stiff-pointed prickle,

prickle, called the Awn, or beard. 4th, Ament is, what is commonly called a catkin; it consists of a great number of chaffy scales, dispersed along a slender thread, or receptacle, and has obtained the name of catkin from it's fancied resemblance to a cat's tail. These Aments are composed of both male and female flowers; the Aments or Catkins of the willow-tree, *salix*, diffuse a fragrant odour around them in early spring; the yellow ones, well known to children by the name of Gossins, from their fancied resemblance to that little animal, contain stamens only, and derive their bright yellow colour from the prolific dust of their tips or Anthers. The green catkins are the female *Aments*, and, when mature, have the appearance of small tufts of wool, which is caused by the downy material with which their seeds are crowned. The female *Aments* of Birch, *Bétula*, are beautiful, being composed of stamens with bright crimson *Anthers* surrounded by pale green scales; the female bloom of Nut-trees is also of an elegant construction, though so minute as to escape general observation. The 5th species of calyx, called a Spathe, wraps round the flower or flowers contained in it, till they are strong enough no

longer to require it's protection, and then they burst forth. Sometimes the Spathe consists of one piece, as may be seen in the snow-drop, *galanthus nivalis*, and daffodil, *narcissus*, *pseudo-narcissus*, and in most plants which have this kind of calyx; sometimes of two, as in the Japan lily, *amaryllis formosissima*; and sometimes of many. Calypstre is the term for the calyx of mosses. Calypstre is defined by Linneus to be the cowled calyx of moss, covering the anther; which definition strongly expresses this species of calyx; it may, however, be necessary to give some more familiar idea: the calypstre resembles a very small extinguisher of a candle, which covers the flower of moss, and protects it's dust, or seed, from injury: in Mr. Curtis's London Flora there are a variety of beautiful specimens of this kind of calyx; and, in the months of November and December, it may be found growing on every bank. The 7th and last species of calyx is the *Volve*, the term used by Linneus for the calyx of *Funguses*, a tribe of plants which requires much elucidation, and, joined to some other families of equally obscure habits, form a class confessedly little understood.

The second part of fructification is the Corol,

rol, or that part of the flower which most attracts our notice, consisting generally of beautifully coloured leaves. Linneus defines it to be formed from the inner rind of the plant, as the Calyx is from the outer; its leaves are called Petals, a term which should be remembered, as it is necessary to prevent confusion betwixt the green leaves of the plant, and the coloured ones of the flower. By the number, division, and shape of the Petals, the different kinds of Corols are distinguished; a Corol is called one-petalled, when it consists only of one piece; two, three, or more petalled, according to the number of pieces of which it is composed. The flower of common Polyanthos is one-petalled, although, on the first view, from its divisions round the margin, it appears to consist of five petals. The best way of knowing, whether a flower consists of one or more petals, is to attempt to take them off all together. The one-petalled flowers, be their divisions ever so deep, have their petals united together at the base, forming a tube, sometimes very long, as in Polyanthos, or very short, as in Verónica. In flowers of many petals they are fixed by the claw to different parts of the fructification, which circum-

stance is frequently of use in distinguishing one flower from another. Linneus has availed himself of it in his formation of the *généra*, or families of plants. The various shapes of the corol are also of great use in this particular, and therefore should be accurately understood*. There are seven different forms of the corol: bell-form, of which there are great varieties; funnel-form; salver-form; wheel-form; cross-form; gaping and grinning corols, which may be considered as different kinds of the same form; and papilionaceous, or butterfly-form, which belongs to the pea-bloom, or lupine tribe of flowers. There is an eighth form, which does not belong to any of these that I have mentioned, and is properly called an irregular flower; of this kind are the monkshood (*aconitum napellus*), violet (*viola*), larkspur (*delphinium*), orchis, and fraxinella (*dictamnus*). Campanula is an instance of the bell-form; of the funnel-form, henbane (*hyoscyamus*,) and oleander (*nerium*); of the salver form, periwinkle (*vinca*); of the wheel-form, mullein (*verbascum*), and pimpernel (*anagallis*); the cross-form may be seen in

* See Plate the Second.

wall-flower (*cheiránthus*), and in candy-tuft (*ibéris*), and consists of four petals nearly equal, and spread at the top upon claws, the length of the calyx, in form of a cross. The butterfly-form is seen in pease; the gaping and grinning in white archangel (*lámium*), and snap-dragon (*antirrhínum*). There is another part of the fructification, which Linneus considers as belonging to the corol, and to which he first gave a name; this is the Nectary; so he has called that part wherein the honey is found, from the fancied resemblance to the fabled liquor of the gods. The nectary frequently forms a part of the corol, but as frequently is distinct from it: the delicious juice, whence it derives it's name, is found in abundance at the base of the tubes of the flowers of honeysuckle (*lonicéra*), and cowslip (*prímula*), and equals the purest sugar in the richness and sweetness of it's taste. A most essential part of fructification is the *stamen*; as by it the fine dust, or powder, is prepared, by which the seeds are to be fertilized, and rendered capable of producing young plants. The Stamen consists of three parts, the Filament, the Anther, and the Dust. The Filament is the thread on which the Anther grows;

grows ; the Anther is that part which is open, ignorantly called the seed ; it contains the Dust, and, when ripe, opens and scatters it abroad, for the use to which nature has destined it. Clouds of this dust may be seen about Nettles, Urtica, at their time of flowering, and Sweet Gale, Myrica. Nature has guarded, with nice care, this precious dust, as on it's preservation depends the continuation of the species. The apparatus, by which in many flowers it is defended from injury, is very curious, and often gives a singular appearance to the corol. In wet years it sometimes happens, that the excess of moisture causes the anthers to burst, before their contents are ripe, and thus we lose our cherries and apples. It has been supposed, that the anthers were preserved from injury in rainy seasons by a fine waxy substance enclosing their contents. This idea was suspected, by Reaumur, to be erroneous some years ago, and the experiments of the late Mr. John Hunter confirm his opinion. Mr. Hunter affirms, that the substance gathered by bees from the anthers of flowers is not wax, as is generally supposed, but that it is collected by them as food for the bee-maggots, and forms what is called the Bee-bread. A

part no less important than the Stamen is the Pistil, as it contains the seed which receives it's fertilization from this dust. The Pistil also consists of three parts, the Germe, the Style, and the Stigma. Germe is the term for that part which contains the seeds in their embryon state; when mature, the same part takes the name of Pericarp. The Style is that small pillar which grows from the Germe, the top of which is the Stigma. The Stigma is a part of great importance, as it receives the Dust of the Anthers, and conveys it's essence through the fine vessels of the Style to the seed contained in the Germe. Indeed the Anther and Stigma are by Linneus esteemed the essential parts of a flower, and in the strict language of botany they constitute one; these parts being present are sufficient to the production of fruit; without them there can be none: the presence of the Stigma implies that of the Germe, as the presence of the Anther does that of the Dust. There is, however, another part, which the investigations of a late celebrated philosopher seem to make of equal importance; this is the Nectary. From his observations it appears, that the honey contained in this part is intended by nature for the

the

the nourishment of the Anthers and Stigmas; consequently, whenever these are found, it will be found also; and, although some flowers have been said to be destitute of it, this assertion may have arisen from want of sufficient investigation, as the part in question was so little known before the time of Linneus, that it had not even obtained a name; and we have yet to acquire the certain knowledge of it's use.

There are eight different kinds of Pericarp, or Seed-vessel: 1st. Capsule, 2d. Silique, 3d. Legume, 4th. Follicle, 5th. Drupe, 6th. Pome, 7th. Berry, 8th. Strobile. Capsule is a little chest or casket, a dry hollow seed-vessel, when ripe, which splits in different ways, and discharges it's contents, sometimes with great force, so as to disperse them to a considerable distance; an instance of which may be seen in the seed-vessels of the different species of Balsam; and, from the violent manner in which their seeds are ejected from the capsules, when mature, Linneus has named the genus, or family, Impatiens. The seed-vessel of viola, violet, and pansie, is a Capsule; before this species of seed-vessel is ripe, it is frequently fleshy and succulent, like a berry, which

which pulpy substance may probably be intended for the nourishment of the young seeds. Silique is a Pericarp of two valves, which varies in size and figure, some being long and larger, others round or broad and less. From their different forms Linneus has distinguished them into Silicle and Silique, and on this distinction has founded the Orders of one of his classes: of the Silicle, which is roundish, the seed-vessels of Allyson of Crete, *Alyssum Saxatile*, furnish an instance, and also those of Candy-tuft (*ibéris*); the common wall-flower (*cheiránthus*), and cabbage (*bráffica*), are examples of the Silique. The Legume is distinguished from the Silicle and Silique by the manner in which the seeds are fixed to it's edges; in the Silicle and Silique the Seeds are placed alternately on each side of their futures, in the Legume they are fixed on one side only; the Silique seed-vessels belong to the cross-form flowers, the Legume to the papilionaceous; and it is this part that we eat of french-beans, and of some kind of pease. *Follicle* is a bag that opens on one side, which circumstance forms the distinction betwixt the *Follicle* and the *Legume* and Silique seed-vessels; Periwinkle, *Vinca*, and Swallow-wort, *Asclépias*,

Asclépias, have their seed-vessels of the Follicle kind, which, when the seeds are ripe, open lengthways on one side. *Drupe* is a *Pericarp*, or seed-vessel, that is generally succulent or pulpy, having no valve or external opening, and generally contains within it's substance a stone or nut, within which lies a seed, commonly called a kernel: there are, however, exceptions to this definition; all the stone-fruits are properly *Drupe*s. *Pome* belongs to those fruits which contain within their fleshy pulp the other kind of seed-vessel called *Capsule*; the apple (*pyrus*) is an instance of the *Pome*: the core of the apple is the *Capsule*; the pippins contained within the Core are the seeds; this kind of *Pericarp*, or seed-vessel, has no valve or outward opening. What is erroneously called the blossom of the apple was the calyx. *Berry* is a pulpy substance containing seeds, disposed promiscuously through the pulp, without other covering; raspberries (*rúbus*), strawberries (*fragária*), gooseberries (*ríbes*), answer well to this definition: in many genera, or families, the berry and the drupe seem to have been imperfectly defined. And here it is necessary to observe, that there are some defects in this most ingenious system of

 Linneus,

Linneus, which may perplex the pupil in botany; who, however, when early apprised of them, will not find his progress much retarded by the difficulties which they may place in his way: a full statement of these defects will be found in Mr. Milne's Botanical Dictionary, a book which should be in the hands of all young botanists, as much information may be derived from it; but it is to be lamented, that the author, instead of pointing out the errors of the Linnean system with the candour due to a work of such great ability, has marked the smallest failings with a most ungenerous acrimony. The Strobile is defined to be formed of an *Ament* with hardened scales, and in common language is known by the name of Cone, or Fir Apple. The Strobiles of the Larch, *Pinus Larix*, are peculiarly beautiful in their early state of growth in spring, their colours being a mixture of tender green and bright crimson. The Strobile is the kind of seed vessel found in all the Fir tribe.

The seed is defined, by Linneus, to be the rudiment of a new plant: a Seed consists of, 1st, the part which is to become the new plant, and, 2d, of nourishment for that new plant till it has attained sufficient strength

strength to provide for itself: the young plant consists of what are termed the *Plume* and the *Radicle*; the *Plume* rises into the air, and constitutes the trunk and branches; the *Radicle* penetrates into the earth, and forms the roots. The *Cotylédons*, which are the mealy substance of the seeds, are converted into a sweet juice by the growth of the plant, and are gradually absorbed by it; from these sweet stores of nutriment, the infant plant draws sustenance, until, by having put forth roots, it has acquired the power of collecting food from the earth; as lambs, and the young of the higher order of animals, suck the milk of their maternal parents until they have attained sufficient strength to seek abroad for their nourishment. The *Plume*, the *Radicle*, and the *Cotylédons*, may be well seen in a garden-bean, *vicia faba*, and should be accurately compared and examined with the same parts in the seed of cucumber, of which a drawing is given in Plate the Third. By laying an almond kernel in water till it is well soaked, and afterwards splitting it, there may be seen within the lobes, or *cotylédons*, two small leaves, distinctly formed, beautifully serrated round their edges, and elevated upon a little

a little foot-stalk, which is the *Radicle* of the seed, as the leaves are the *Plume*. If the Cotylédons of a bean be cut off, the young plant, being deprived of nutriment, is starved and dies, or becomes very weak; grass has it's Cotylédons under the ground, which preserves them from destruction; so has corn, which, however, is not safe from all enemies; the wood-pigeon digs with her bill till she finds the Cotylédon of the corn, and then eats it, pleased, probably, with the sweet taste it has acquired in the process of germination as the Plume has sprouted. The care taken by nature for the preservation and dispersion of seeds is admirable: in some plants she has wrapped them in soft down; as, for instance, in Cotton Plant, *Gossypium*; the part from which our muslin dresses are made having originally formed the soft cradle of seeds; as the material, of which our silks are made, was the cradle of an insect. Some seeds are nourished and kept warm by the pulp of our fruits; others are protected by soft hairs: in thistles (*carduus*) they lie in a soft silklike substance, the down of the seed of artichoke (*cy'nara*) is particularly beautiful; others are surrounded by what is termed an Aril. In

the definition of this term Linneus has departed from his usual accuracy; he has defined the *Aril* to be, “ the proper exterior coat of “ the seed,” from which it is evidently wholly distinct, and rather may be said to form a part of the Pericarp, or seed-vessel, than of the seed itself. In *Fraxinella*, *Dic-tamnus*, the Aril is very conspicuous, being composed of a material resembling parchment, and is found lying within the sweet-scented outer-husk of the Capsules. In wood-forrel, *Oxalis acetosella*, the Aril is a little white case, which, if held in the hand till warm, bursts with considerable force, and the small shining black seeds leap from their coverings with surprising velocity. Nature has not been more various in her modes of protecting the different kinds of seeds from injury during their infant state, than she has been ingenious in the means she has contrived for their dispersion, when arrived at an age of maturity. Some she has enabled to fly by a small light crown fixed on their tops, others have single feathers, others small feathery tufts: every child is well acquainted with the feathered seeds of dandelion (*leóntodon*), and has proved, by blowing on them, how small a degree of air is required
for

for their dispersion, when ripe. Some have an appendage like a wing, as the seeds of sycamore (acer); one of the species of centaurea has a seed furnished with a tuft so nearly resembling a camel-hair pencil, that it might be mistaken for one; feather-grass (stipa) has a beautiful plume; one of these plants makes an elegant appearance, when in a bright day, with a gentle wind, a number of these plumes are seen together, waving in the air, and shining like silver. But the most curious of the flying seeds is that of the tillandsia: this plant grows on trees, like the mistletoe (viscum), and never on the ground; the seeds are furnished with many long threads on their crowns, which, as they are driven forwards by the winds, wrap round the arms of trees, and thus hold them till they vegetate: this is very similar to the migration of spiders on the gossamer, who are said to attach themselves to the end of a long thread, and rise thus to the tops of trees or buildings, as the accidental breezes carry them. These flying seeds are carried to a very considerable distance from their parent plant; others have hooks, by which they attach themselves to the hair or feathers of animals, or a glu-

tinous substance, in which the seed is lodged, as mistletoe. The seeds of aquatic plants, and those which grow on the banks of rivers, are carried many miles by the currents, into which they fall; some of the American fruits, among which is the cocoa-nut (cocos), are annually thrown on the coasts of Norway. Some account of these emigrant seeds, with some beautiful lines to which this wonderful fact has given rise, may be seen in the Botanic Garden*, a book which contains such variety of knowledge, on the subject of botany, and that knowledge so distinctly and agreeably given, that there cannot be one from which more information or amusement can be derived.—Birds are the means of disseminating some kind of seeds, either by dropping them as they carry them from place to place, or by parting with them whole, after they have swallowed them. In this way seeds are frequently dropped in the hollows of trees, in which situation, if they meet with a sufficient quantity of soil and moisture, they vegetate, and make an extraordinary appearance, forming an union of two distinct species. A

* See Part the Second, p. 128, l. 411.

Mountain-Ash, thus engrafted betwixt the branches of an Apple-tree, is now growing in my garden, and continues yearly to increase in size and vigour, exhibiting a striking contrast to the old decaying tree by which it is supported. It is not exactly known in what manner such trees receive their nourishment; probably they become parasite plants, and derive their food from the juices of the tree to which they are attached, or, perhaps, live chiefly on the air, as those trees must necessarily do, which grow in the fissures of rocks or walls, where there is not earth sufficient for their sustenance. Lastly, seeds are perished by an elastic force in the seed-vessel, or in some part belonging to the seed. *Stipa* (feather grass), as it's seeds arrive at maturity, dislodges them, by twisting the base of the long feather by which they are crowned, till it detaches the seed from it's receptacle, and carries it to a considerable distance from the plant: thus are the seeds of *Geranium* and *Oat* dispersed by the twisting of the *Awns* which crown them.

The Receptacle is the last part of fructification that is to be considered, by which all the other parts of fructification are con-

nected, and by which they are supported: it is called a proper receptacle when it supports the parts of only one flower, as in *prímula*, *anemóne*, and *tulip*; a common receptacle, when it supports several florets. This last kind of receptacle belongs to what are called the compound flowers, an explanation of which must be deferred until those plants come under consideration. An instance of a *common* receptacle may be seen in *scabious* (*scabiósa*), *dandelion* (*leóntodon*), and *daisy* (*béllis*); all those parts, which appear to be the leaves of one flower, are perfect flowers themselves. And here I recommend to my pupils, whether children or adults, to acquaint themselves intimately with the seven parts of fructification, and with the various species of Calyx, Corol, Pericarp, and Seed, as described in this first lecture; which may be effected by comparing the different parts of natural flowers with the drawings given of them in Plates Ist, IId, and IIId.

THE UNIVERSITY OF CHICAGO

DEPARTMENT OF THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

THE HISTORY OF ARTS

EXPLANATION OF PLATE I. PART I.

OF THE SEVEN PARTS OF FRUCTIFICATION.

Fig. 1. The parts of Fructification of a Crown imperial.
Fritillaria imperialis.

a, a, a, a, a, a. The Petals.

b, b, b, b, b, b. The Stamens.

c, c, c, c, c, c. The Anthers.

d. The Germe.

e. The Style.

f. The Stigma.

Fig. 2. A Petal and Stamen of Crown imperial. *g*, the Nectary. *h*, the Anther scattering it's Dust.

Fig. 3. The Pericarp of Crown-imperial cut across to show the three Cells.

Fig. 4. The Perianth of a Rose, *i, i, i, i, i*.

Fig. 5. The Involucre of *Prímula*, *k, k*, with the Perianth of the single Flower, *l*.

Fig. 6. A Flower of Grass. *m*, the Glume. *n*, the Stamens. *o*, the feathered Stigmas of the Pistils.

Fig. 7. A Male Ament, containing the Stamens only.

Fig. 8. A Female Ament, containing the Pistils only.



Fig. 4.



Fig. 7.



Fig. 8.

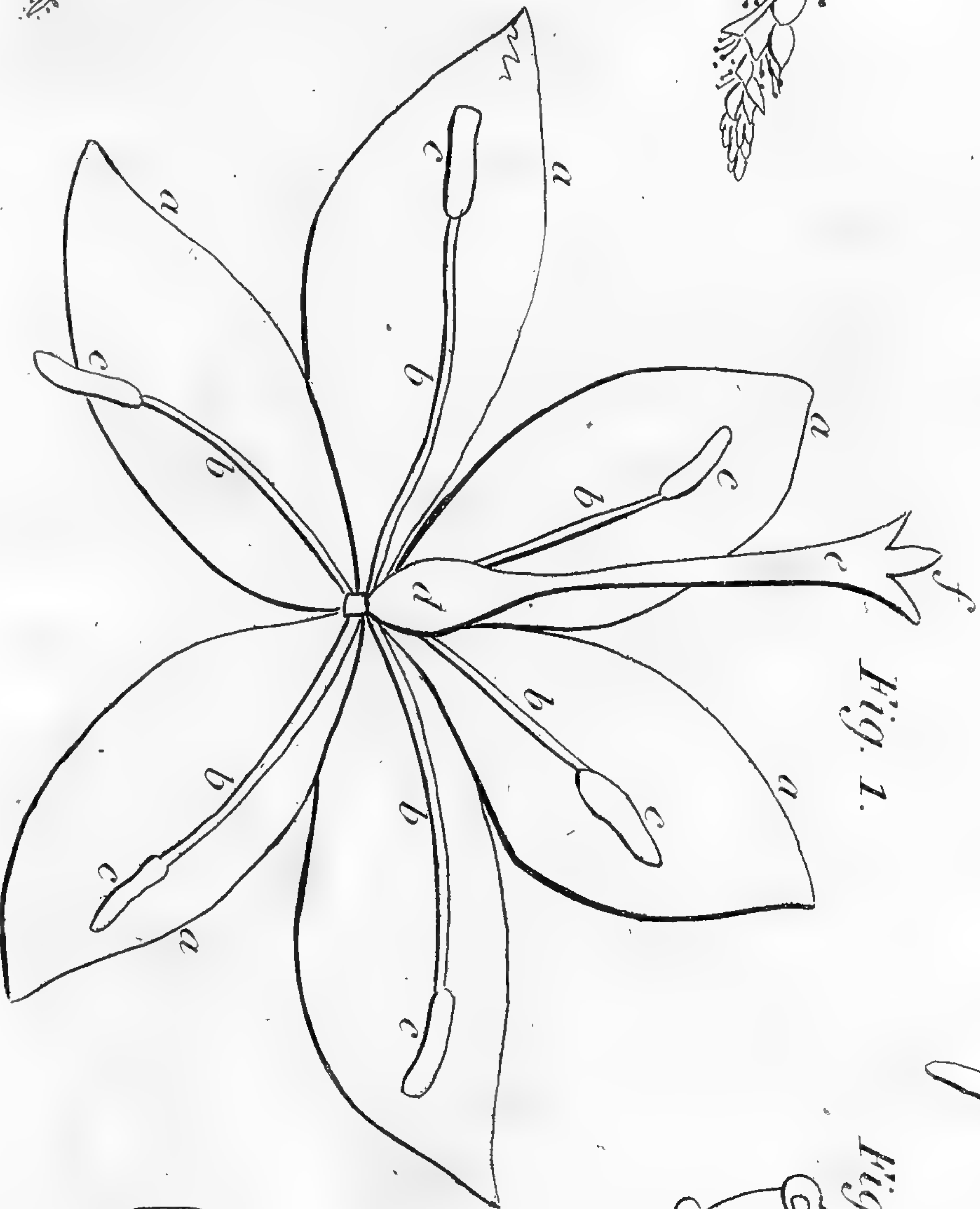


Fig. 1.

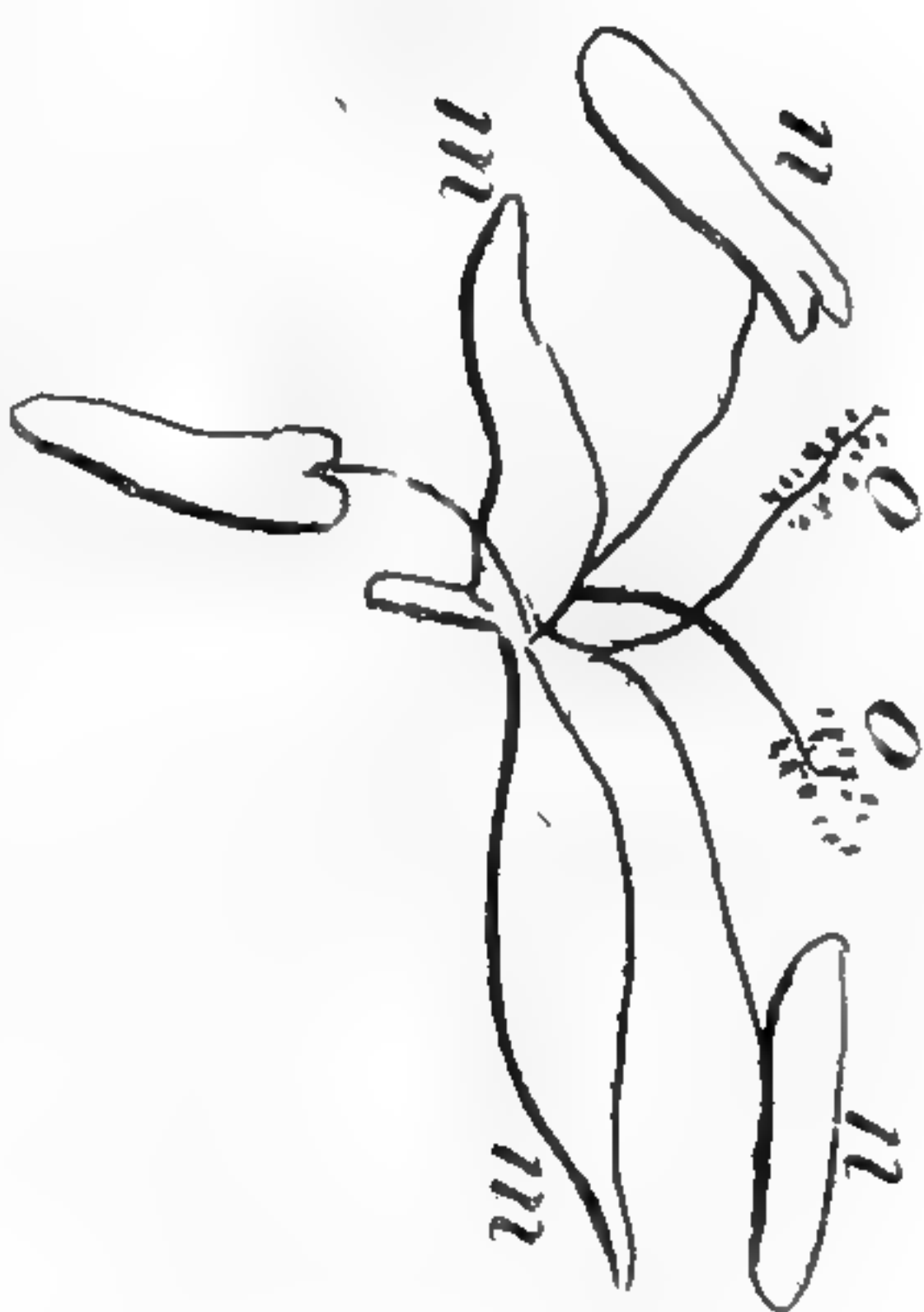


Fig. 6



Fig. 3.

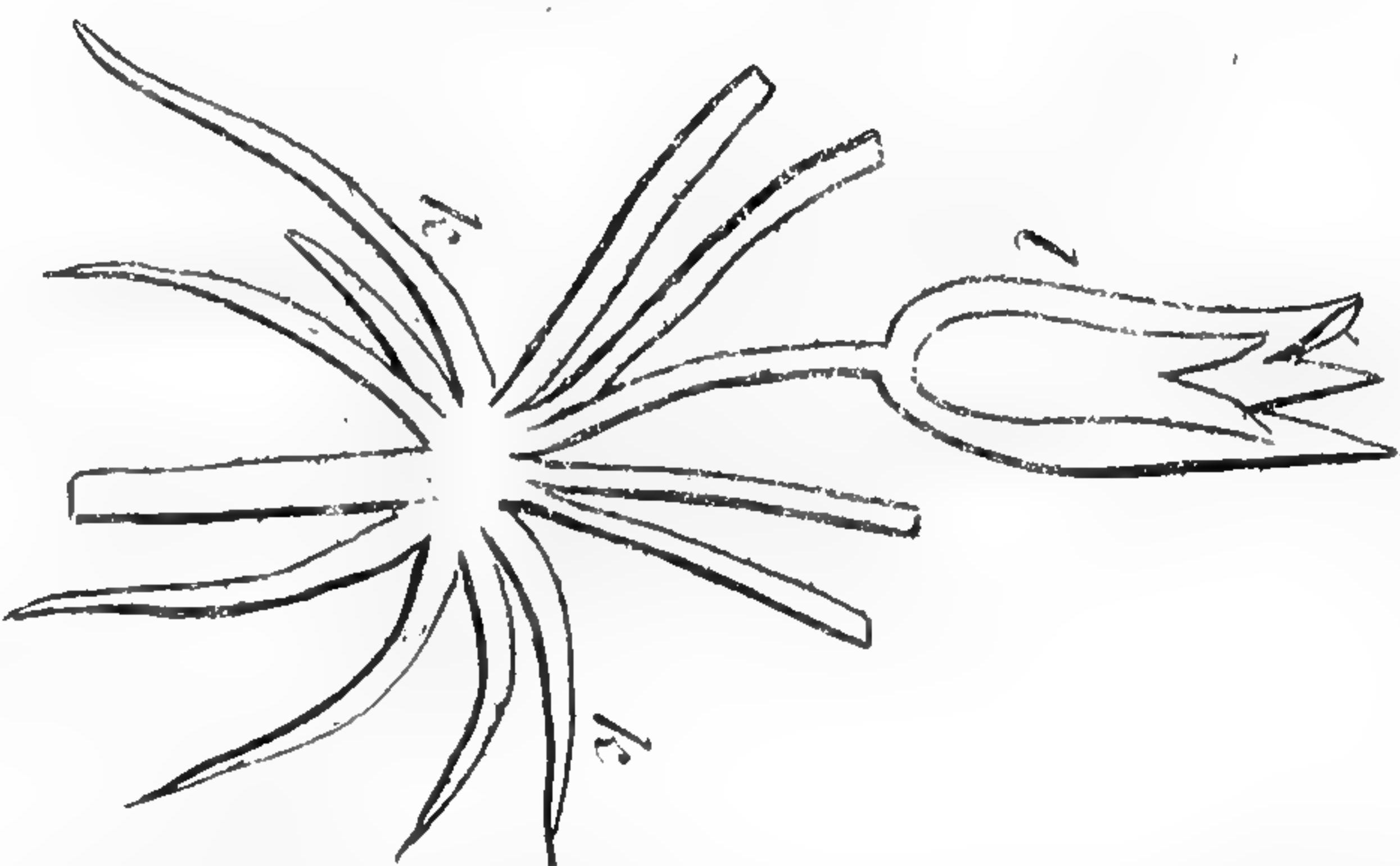


Fig. 5.

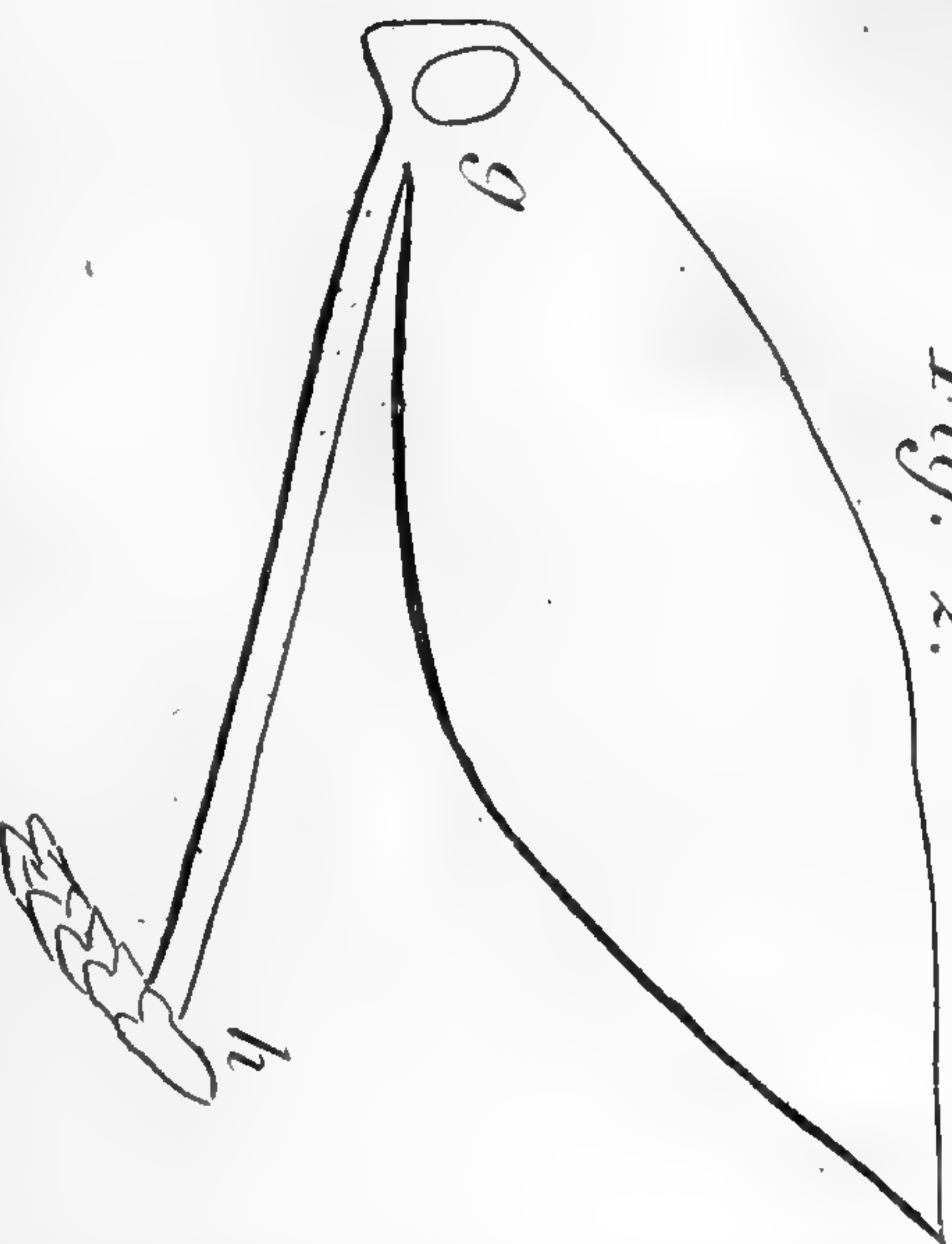


Fig. 2.

EXPLANATION OF PLATE II. PART I.

OF THE DIFFERENT SHAPED - COROLS AND KINDS OF SEED VESSELS.

Fig. 1. A Spathe, *a, a*, enclosing the Peduncles of the Flowers.

Fig. 2. The Calyx of Moss, Calyptrae, *b, b*.

Fig. 3. The Calyx of Fungus, *c*, called by Linneus a Volve.

Fig. 4, 5, 6. Different kinds of the Bell-form Corol.

Fig. 7. Funnel-form, *d*, the Calyx, a Perianth.

Fig. 8. A regular one-petalled Corol with a long tube, the Corol Salver-form.

Fig. 9. Back view of a Wheel-form Corol, showing the very short tube.

Fig. 10. Cross-form.

Fig. 11, 12, 13. Gaping and Grinning Corols.

Fig. 14. Papilionaceous, Butterfly-form.

Fig. 15. A Capsule, with three Valves opening at top, *a, a, a*.

Fig. 16. A Capsule cut open lengthways.

Fig. 17. A Silique and Silicles, *b, b*, Silicles.

Fig. 18. A Legume.

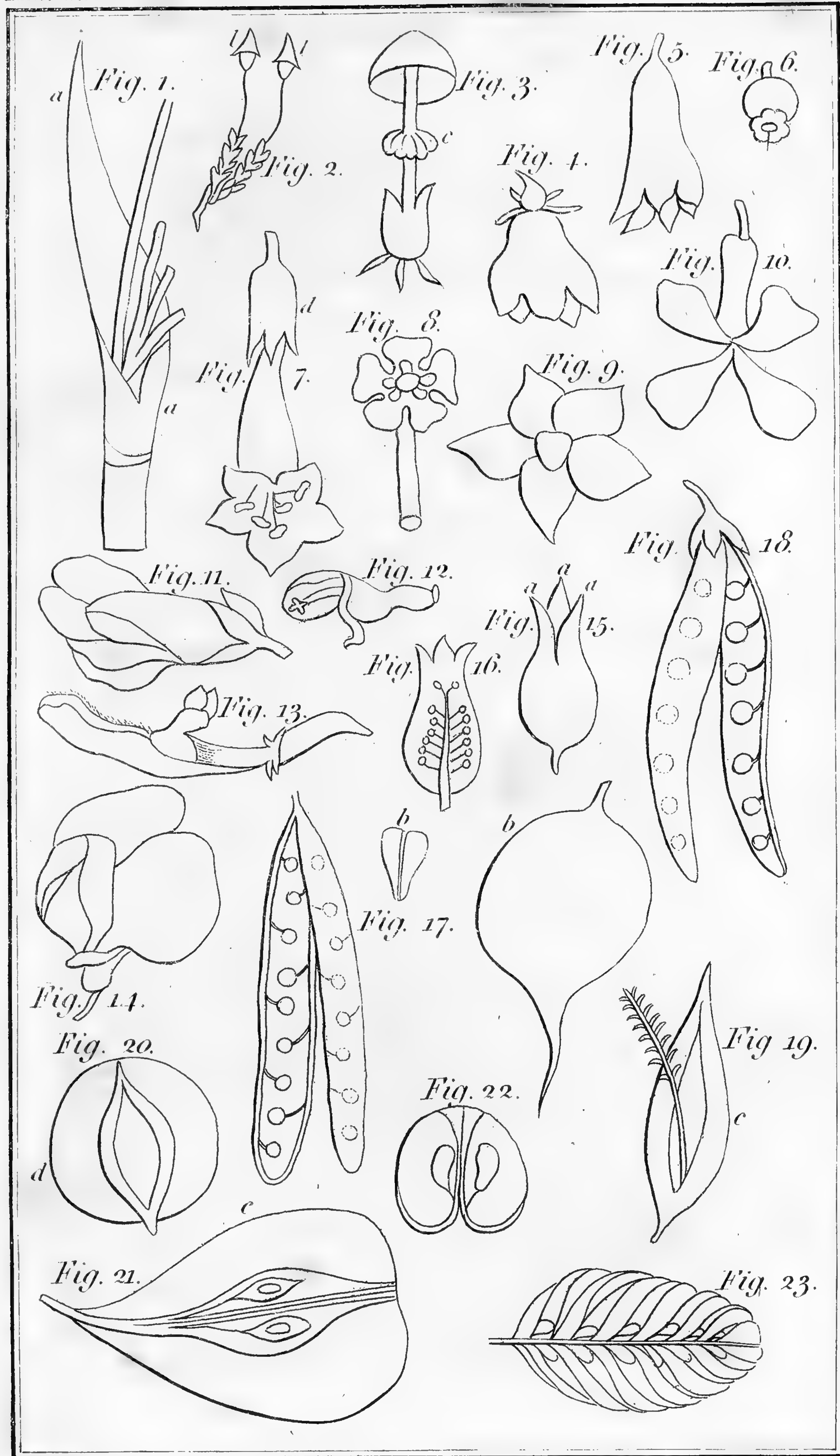
Fig. 19. A Follicle, with it's receptacle for Seeds, *c*.

Fig. 20. A Drupe, *d*, the Stony Seed.

Fig. 21. A Pome, *e*, the inside Capsule.

Fig. 22. A Berry (A Grape) cut across, showing the Seeds.

Fig. 23. A Strobile, cut lengthways.



LECTURE II.

A Flower dissected: the different kinds of Fulcra and Inflorescence explained.

THE seven parts of fructification, with all their varieties, being well understood, the dissection of a few flowers will be both amusing and instructive. The Verónica and Crowfoot are plants which may be found near every house, and afford specimens of the Perianth kind of calyx; the earth-nut (búanium) is an instance of the Involucre, and at the same time the single florets show the *Perianth*, although so very minute that it is liable to escape the notice of common observers. The male bloom of walnut (júglans) shows the Ament; the narcissus the Spathe. The other three kinds of calyx, the Glume, the Calypstre, and the Volve, as they belong to peculiar and difficult classes of plants, would at present only perplex; the study of them will be therefore better deferred till the pupil is farther advanced in his knowledge of botany.

The verónica and hare-bell, hyacinthus non scriptus, have the appearance of many-petalled flowers; but if the corols are taken with care from their receptacles, they are found to consist of one piece slightly united at the base. In the hare-bell and verónica we have instances of the bell-form and wheel-form corols, although the wheel-form of the verónica is less decided from the inequality of the breadth of the division of it's petals, the lower division being narrower than the three upper ones; which nice circumstance is made use of by Linneus to distinguish this family from all others to which it bears any resemblance. The curling divisions of the corol of the hare-bell disguise it's form also; but in neither of these génera is the form of the corol the essential character of the family; and is therefore of less importance. The Genus of crowfoot (Ranúnculus) is discriminated by an appearance equally minute as that of the verónica; a small protuberance at the base of the inner part of each petal being found in every individual of the ranúnculus tribe, even in the double flowers, affords a marked characteristic of that family. The minute circumstances, of which Linneus has availed himself

himself in the discrimination of one plant from another, fills us with admiration; till his time there was much confusion in the ranunculus tribe; his penetrating eye marked this small appendage to the petal, to which he has given the name of Nectary; he found it to exist uniformly in the individuals of the genus; and we are now no longer at a loss to distinguish a ranunculus from other families, which in their outward appearance much resemble it.

The different genera of flowers are more easily distinguished from each other than, from their first appearance, might be imagined, though rarely by so obvious a character as this of the ranunculus; yet, in the study of the system of vegetables, it will be found that very minute circumstances, and such as in the common observation of a flower might be overlooked, have been made use of to mark not only one family, but every individual of that family, from each other.

The lady-smock (cardamine) is a proper specimen of a cross-form flower; the lungwort (pulmonaria), of the funnel-form; the thyme (thymus), of the grinning; the broom (spartium), of the butterfly. The larger kind
of

of flowers are those which should be made choice of by the young student for dissection, as their parts are more distinctly visible; the crown-imperial (*fritillaria imperialis*), the poppy (*papaver*), and the tulip (*tulipa*), are well suited to this purpose, although there are circumstances in each which may perplex a novice in the science. The calyx of the poppy falls off immediately when the flower expands; the crown-imperial and the tulip have not any. Linneus esteems only two parts of fructification necessary to constitute a flower, in the language of botany, though, perhaps, there might properly be added a third, the *Nectary*: the calyx is the part wanting in the tulip and crown-imperial; but when only one of these covers is found, it must not be inferred to be the corol because it is not green. Although in most cases the Corol may be known by the gayness of its colour, or by its not enclosing the seeds, there are too many exceptions to these rules to allow them to be wholly relied on. The petals in passion-flower (*passiflora*) are green, like the leaves; the corol in *Selago* encloses the seeds. The calyx and corol may, however, be distinguished by the following rule: the stamens
and

and petals are found to be ranged alternately in the complete flowers; that is, such as have both Calyx and Corol of the fourth and fifth classes of Linneus's system; hence this is concluded to be their most natural situation, while the stamens are placed opposite to the divisions of the Calyx. Linneus seems to consider this as a constant mark; yet he terms the single cover of many plants of the sixth class a Corol, in contradiction to this rule. There is only one cover present in the crown-imperial, the stamens and petals are placed alternate; it is therefore a *Corol*. Although a close observance of this rule would lead to error in the examination of many of the beautiful flowers of the sixth class, it will be expedient for the pupil in botany to follow Linneus in the term he has given to the only cover that will be found, and call it the *Corol*, leaving these small defects of his system to be corrected by those who, from being acquainted with it's superior merit, are more desirous to contribute their efforts to render it perfect, than to expose and cavil at the few errors which may be discovered in a work of such superior genius and extensive utility. The crown-imperial has all it's parts except
the

the calyx; the corol is six-petalled and belled: the grace with which the beautiful bell-flowers are hung round the summit of a tall, rich, green stem, and the elegant appearance of the tuft of narrow shining leaves rising from the midst of them, with the small cavity at the base of each petal filled with a pure crystalline liquid, render the whole one of the first objects of admiration to all who have a taste for the natural beauties of a flower garden. Nor is the outward appearance of this lovely plant alone worthy of admiration; the honey drops contained in the cavities at the base of each petal are objects of much curiosity, the quantity being so nicely adapted to the parts by which it is contained, as to preserve them always full and apparently ready to overflow, and yet never to exceed it's proper limits. The stamens and pistils of crown-imperial are very conspicuous; each particle of dust, when viewed through a microscope, exhibits the most perfect form. The style and stigma should also be examined: we may perceive, with the naked eye, the moisture at the top of the stigma, which fits it to receive the dust of the Anther, and to convey it's essence through the style to the

3

Germe;

Germe; when this Germe becomes a *Pericarp*, or, in other words, when it arrives at maturity, it is a Capsule filled with large flat seeds. There is no peculiar curiosity in the Receptacle of the crown-imperial, nor does there often occur any in the common classes of flowers. There is a part which may be mistaken in some flowers for their Calyx; this is what is termed the Bracts, or Floral-leaves; these are situated on the petiole, or flower-stalk, and often so near the fructification as to be confounded with the Calyx. Examples of the Bract may be seen in tilia (lime-tree), monarda, passiflora, passion-tree; the Bracts may be distinguished from the Calyx by their longer duration; they differ in size, shape, and colour, from the other leaves of the plant, but commonly continue as long as they do; whereas the Calyx always withers when the fruit is ripe, if not before. An instance of this kind of Bract is seen in the beautiful bunch of leaves which rises among the flowers of crown-imperial, and which has just now been described. There is a species of sage (*salvia*) the Bracts of which are beautifully coloured; sometimes they are red, and sometimes of a deep blue. Linneus has made

great use of these singularities in determining the species of plants; hence it is necessary they should be well understood. The Bract is ranked amongst the Fulcra or supports of plants, which will be made the subject of the next lecture. The poppy and tulip show the stigma attached to the germe, without the intervention of the style; the germe of poppy with it's stigma is very beautiful; the stigma shuts up the germe, like the lid of a box; when the germe is mature, it is of that species of seed-vessel called a *Capsule*, and opens at the top in several places to give passage to the seeds, which are very numerous. From one head of white poppy 8000 seeds are said to have been produced in one summer. This has been ascertained by counting the number of seeds, which would weigh a grain or two, and then by weighing the whole. Seeds of all kinds well repay the trouble of examination, when, viewed through a microscope, infinite beauty appears in their construction, which, from the minute size of many of them, is lost to the naked eye. The variety that may be found in seeds is very great, both in size, shape, and surface, also in the vessels which contain, and the substance which encloses

closes them, before they are ripe. If the difference in the size of the cocoa-nut seed, and that of the poppy, be considered, it will be obvious, that the sizes must be very various between these two extremes. The appendage which nature has given to seeds for the purpose of their dissemination, frequently is a great addition to the beauty of their appearance. The seed of common chickweed is a beautiful microscopic object, the surface resembling the *Murex* shell; and a knowledge of a great variety of seeds may be agreeably acquired from the elegant coloured engravings of many different species in Mr. Curtis's London Flora.

Linneus has named those parts of plants, the chief use of which is to strengthen and support them, Fulcra, or Props; *supports* is the term given them in the translation of the system of vegetables: they are defined to be, assistances for the more commodious support of the plant. There are *seven* kinds of Fulcra, or Supports: Petiole, Peduncle, Stipule, Tendril, Pubescence, Arms, Bract. Petiole is the foot-stalk of a leaf, which it supports without any flower. Peduncle is the foot-stalk of the flower. Petiole is defined to

be a prop supporting the leaf. Peduncle, a prop supporting the fructification. Stipule is a scale, or small leaf stationed on each side of the base of the Petioles, or Peduncles, when they first begin to appear, as may be seen in the Papilionaceous, or butterfly-shaped flowers. The stipules of all plants should be attended to, as they frequently serve to distinguish one species from another; those of the tulip-tree (*liriodéndron*) are particularly obvious, consisting of two large bluish scales: within these are deposited the infant leaves of the plant, which may be often found so small as to render a microscope necessary to the accurate examination of them, when they will be found perfectly formed in every part. By the Stipules they are protected and cherished until they have acquired sufficient strength to support themselves. The Stipules of the plane-tree (*plátanus*) add much to the beauty of the tree in spring, being formed like little ruffs which surround the branches. In peach (*amygdalus*) and bird-cherry (*prúnus*) the Stipules resemble two very small narrow leaves, and are seated at the base of the Petiole of the common leaves. The Tendril is a species of Stipule with which every one is acquainted; those

those plants are generally furnished with this kind of Stipule, which are not strong enough to support themselves. Vines (*vitis*) twist themselves round other trees by their clasps or tendrils, and thus raise themselves from the ground. Long poles are placed in our hop-yards for the support of the hop plants (*hú-mulus*), which make a very elegant appearance in their most luxuriant season; their natural place of growth is in hedges, where they readily find supporters: all these climbing plants are in some degree injurious to the tree of which they take hold for support, as they deprive it of that share of light and air to which it has a natural right. There are, however, some species of climbers which seem intended by nature to receive their nourishment from other plants, as dodder (*cuscúta*). The seed of this plant splits without Cotylédons, so that the young plant, having no store of nourishment laid up for it by nature, seems necessitated instantly to find a foster-mother, or to perish; when the seed splits it protrudes a spiral body, which, without making any attempt to root itself in the earth, ascends the vegetables in its neighbourhood, twisting round them, and absorbing

it's nourishment by vessels apparently inserted into it's supporters: this must injure the plants on which it lives materially. Nor is this the only way by which it is destructive to it's foster parent; for no sooner does it arrive at a state of strength and vigour than it expands it's branches, and overpowers and smothers it's protector. There are but few instances of such plants as *cuscuta* in the vegetable kingdom. In most situations the injury is small, which the supporters of the climbing plants sustain from the assistance they afford to their more feeble brethren, as, generally, climbers have roots which strike into the earth, and thence draw nourishment. Some of this tribe of vegetables are made use of at our tables; the tops of hop plants are much sought after in spring.

Climbing plants are of such quick growth that their tops are always tender, and, when rendered mild by boiling, are agreeable food. The tops of white bryony (*bryonia*) are said to be sweet and pleasant to the taste. There is one plant of the parasite kind the history of which is curious, as it appears to be so from choice: it first vegetates in the earth, and is sometimes found growing in it; nor has it
any

any want of support from it's neighbours, being a stiff short-stemmed plant; this is the *orobánche major*; it grows upon the roots of other plants, chiefly upon the butterfly-flowered tribe: it has an extremely small seed, which makes it difficult to show it's vegetation by experiment, more particularly as it requires a peculiar soil and situation for it's culture. Mr. Curtis, in his *London Flora*, gives a plate of it, and supposes, that, when the seed has first vegetated in the earth, the Radicle shoots downwards, till it finds a proper root to attach itself to; that then it quits it's parent earth, and becomes parasitical. In this state it is frequently found upon broom hills, the roots of the common broom (*spartium scopárium*) being peculiarly grateful to it; though, when it contents itself with the earth for it's nutriment, it grows in corn-fields and on hedge-banks. The fifth kind of Fulcra, Pubescence, might, perhaps, have been more properly denominated a defence than a support. This term is applied to every kind of hairyness which exists on plants. If the young parts of plants be examined by a microscope, particularly the young stalks or stems, almost all of them will be found covered with hairs:

this clothing in their tender state seems intended to preserve them from severe winds, and from the extremes of heat and cold, which purpose it is well adapted to answer. Arms is the general term for those points, which prevent animals from injuring the plants; these arms consist of Prickles, Thorns, Forks, and Stings. The shrubs and trees which have Prickles and Thorns for their defence are grateful food to animals, as gorse (*úlex*) and gooseberry (*ríbes*), and would be quickly devoured, if not thus armed. The large hollies in Needwood Forest are armed with thorny leaves about eight feet high, and have smooth leaves above; which is a curious circumstance, as it would seem to imply a consciousness in the trees, that when their branches were out of reach of the deer, they had no occasion for arms. But though they may thus preserve their lower branches from the attacks of the deer, they cannot defend themselves from the depredations of the keepers, who lop their upper boughs in winter, and strew them on the ground, and thus furnish their herds with a grateful food, when herbage is scarce. The deer peel off the bark from these branches with great dexterity; and this with the
smooth

smooth leaves forms a great part of their sustenance in severe winters. Stings, as in nettles (*urtica*), are the pipes of a small bag furnished with a venomous fluid; when the sting, or point, has made the wound in the finger, which has touched the plant, this fluid passes into it, and causes acute pain. There are many curious contrivances for the defence of plants, which may be considered as arms. On the leaves of Venus's flytrap (*dionæa muscipula*) there is a wonderful contrivance to prevent the depredations of insects; the leaves are armed with long teeth, and lie spread upon the ground round the flower-stem, and are so irritable, that, when an insect creeps upon them, they fold up, and pierce or crush it to death. We have a plant of our own country, which, in its curious mechanism, greatly resembles the so much celebrated flytrap; this is the sundew (*drosera**): its round flat leaves are thickly beset with hairs, both on their upper surface and on the margin; each of these hairs is crowned with a little purple globule, which in the sunshine exudes a pellucid drop of mucilage, and gives the whole plant a beau-

* See Plate the Third.

tiful appearance. These hairs with their viscid juice entangle the flies, which attempt to plunder the leaves, so completely, that, when once enclosed by them, it is not possible they should escape. It is also supposed, that the leaves of the *drosera* possess a power of folding themselves upon the insect, that they would destroy, in a manner similar to those of the flytrap. This elegant little plant grows commonly upon marshes, and upon wet parts of heaths and on ditch banks; in these situations they are not difficult to discover, as they form a little red patch, which immediately attracts the eye. There is also a viscid juice surrounding the stems of some plants, which effectually defends them from the depredations of insects, as they cannot extricate themselves from this glutinous material, if, by an attempt to settle upon the stalks, they become entangled by it; from this circumstance a species of *Silene* has obtained the common name of catch-fly. There are many more extraordinary arts, which nature has used to preserve the vegetable kingdom from its numerous enemies of the animal creation. This curious and interesting part of the subject of botany must, however, be

be reserved for proficient in the science, as it more properly belongs to the philosophical part of that agreeable study. The Bract, or floral loaf, has been explained in the last lecture. There is another kind of flower-stalk beside the peduncle, which is termed *Scape*. The Scape is that kind of flower-stem which raises the fructification without the leaves; it is a naked stalk proceeding immediately from the root, and terminated by the flowers. Hyacinth (*hyacinthus*), lily of the valley (*convallaria*), and aloe, are examples of the Scape. The small stalk belonging to each flower is termed a Peduncle. An acquaintance with the different kinds of flower-stalks is essential to an accurate knowledge of the various modes of Inflorescence, a term which signifies the various manners in which flowers are joined to their Peduncles. There are seven different modes of Inflorescence, distinguished by the following terms: Verticil, Head, Spike, Corymbe, Thyrses, Raceme, Panicle. The Verticil is that kind of Inflorescence where many flowers surround the stem like a ring, or ruff, the individual flowers standing upon very short peduncles, dead-nettle (*lámium*), and lavender (*lavandula*),
bear

bear their flowers in a Verticil, or Whorl. Head has many flowers collected into a globe on the summit of the common stalk, sometimes with, and sometimes without, distinct Peduncles. Clover and globe amaranthus (*trifolium* and *gomphréna*) show this kind of Inflorescence; it is distinguished into various kinds by it's shape and other circumstances. Sweet William (*diáanthus barbatus*) has it's flowers in that species of head which is called a Fascicle, though it seems that the mode, in which the flowers of sweet william are put together, would place it more properly under the term Cyme than Head. The Spike has it's flowers placed alternately round a common simple peduncle, without any partial ones, which is called being sessile, or sitting close on the stem. Many of the grasses have their flowers in Spikes: a Spike is called one-ranked, or a single-rowed spike, when the flowers are all turned one way following each other; a double-rowed spike, or two-ranked, when the flowers stand pointing two ways, as in darnel (*lólium*). The Spike, like the Head, is distinguished into various kinds by it's shape, and other varieties. The Corymbe is formed by the partial peduncles produced

produced along the common stalk on both sides, which, though of unequal lengths, rise to the same height, so as to form a flat and even surface at top. *Spiræa opulifolia*, and candy-tuft (*ibéris*), also are examples of the Corymbe. The earth-nut and parsley resemble the Corymbe in their manner of flowering: there is, however, this distinction, the flowers which form the general bunch of parsley (*ápium*) and earth-nut (*búanium*), which is called an umbel, all grow from the same centre; whereas those of the Corymbe grow from different parts of the common flower-stalk. The Thyse is the mode of Inflorescence we have now to consider. The flower of lilac (*fyrínga*), and of butter-bur (*tuffilágo*), are examples of the Thyse. Linneus calls it a panicle condensed into an egged form; the lower peduncles, which are longer, extend horizontally, or cross-way; the upper, which are shorter, mount vertically, or in a perpendicular direction. The raceme has its flowers placed on short partial peduncles, proceeding like little lateral branches from and along the common peduncle; the raceme resembles a spike in having the flowers placed along the common peduncle; but differs from that mode of inflorescence

cence in having partial peduncles; it also differs from the corymbe in the shortness and equal length of it's peduncles, not forming a regular surface at top. The vine (*vitis*) and the currant (*ribes*) bear their flowers in Racemes. The Panicle has it's flowers dispersed upon peduncles, variously subdivided, and is a branching diffused spike, composed of a number of small spikes, that are attached along a common peduncle. Oats (*avena*) have their flowers in Panicles.

We have now gone through the various terms given by Linneus for the manner in which flowers are placed upon their peduncles, all of which are ranked under the term Inflorescence, and should be carefully impressed upon the memory. Flowers are also sometimes found growing on the leaves, as in the genus of *Ruscus*. Dr. Thunberg takes notice of this singular kind of inflorescence in his account of Japan, having seen it in the *Osyris Japonica*, and calls it a most rare circumstance in nature. From it's rare occurrence, probably, Linneus has not thought it necessary to distinguish this mode of inflorescence by any particular term, though in the *ruscus*, where it occurs, he calls it leaf-bearing. The

umbel, which has been before explained, the cyme, and the spadix, he has ranked under the general term Receptacle. The cyme and umbel are much alike, both having a number of slender peduncles growing from one common centre, which rise to the same height; they differ, however, in the cyme having its partial peduncles dispersed along the stalk without any regular order. Elder (*sambucus*) and laurustinus (*viburnum*) are specimens of the cyme. The term Spadix is used to express every flower-stalk that is protruded from a spathe or sheath; the family of palms have their flowers in a spadix, which is branched. The spadix of all other plants is simple. There is yet another term, which Linneus makes use of, which is Rachis; this means only the stem, on which the flowers grow that form a spike. He defines the Rachis to be a thread-form receptacle, connecting the florets longitudinally into a spike. There may appear much difficulty in the attainment of an acquaintance with so great a variety of terms which convey no precise ideas; an attentive consideration of them, with a comparison of the definitions of the different kinds of Fulcra and modes of Inflorescence,

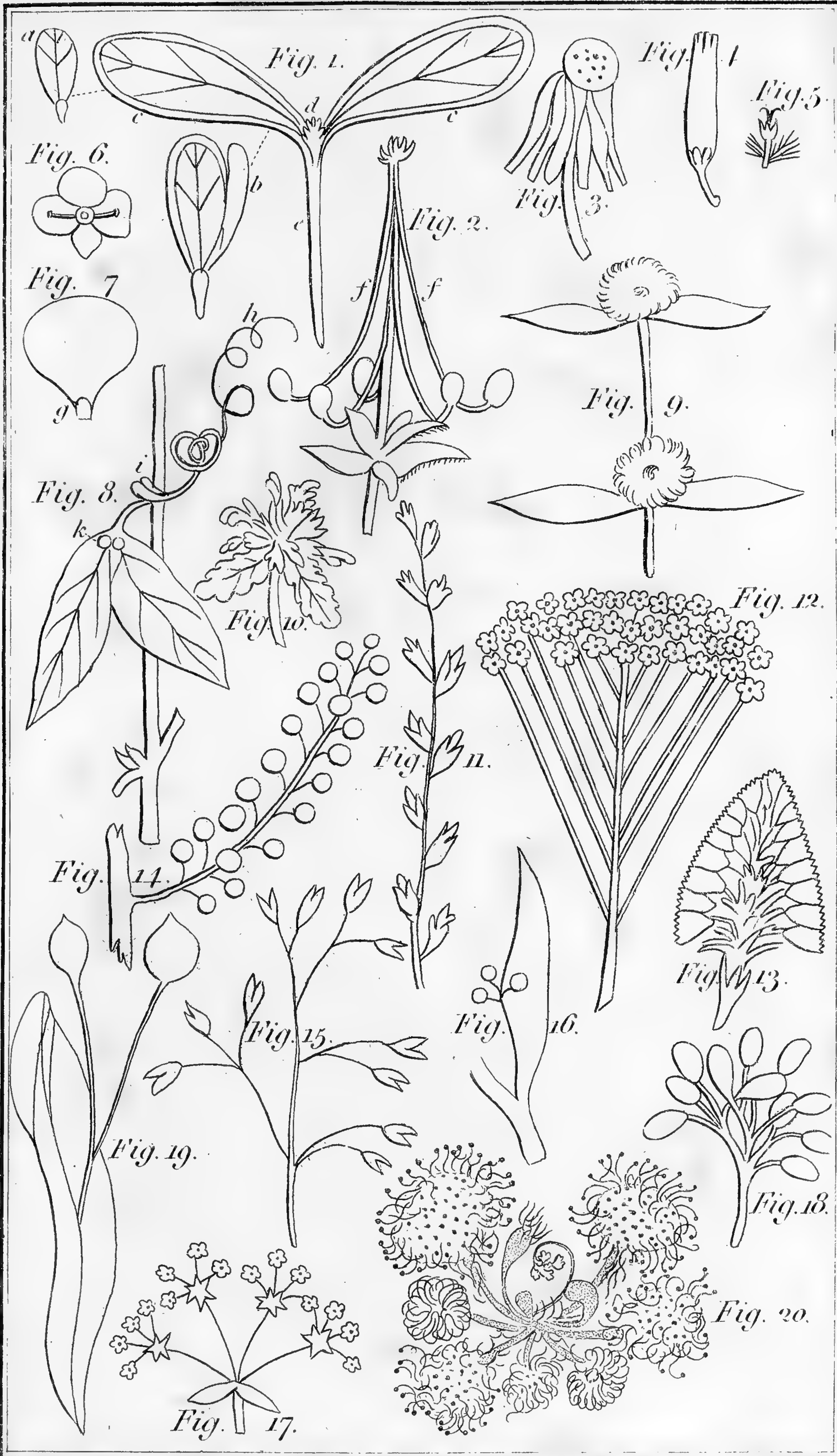
reference, with the drawings of them in Plate the Third, will, however, render the task by no means a hard one. Botany has been reckoned a dry study of names and terms; and this view of the science has deterred numbers from attempting to acquire a knowledge of it. This is by no means peculiarly the case; every science has a language appropriate to itself; every language has a grammar: these difficulties must be surmounted before the science or language can afford entertainment. In Botany, however, instruction and amusement may be united, if, as the pupil proceeds, he examines and compares the different parts of flowers with the terms appropriated to them. By this means the beauties of nature will open to his view, and he will in the very commencement of his studies obtain a glimpse of that wonderful order and mechanism, which are to be found in the vegetable creation, and which render botanical pursuits so completely interesting.

E

EXPLANATION OF PLATE III. PART I.

OF INFLORESCENCE.

- Fig. 1. A Seed of Cucumber, *a*, before it is put into the ground. *b*, Beginning to germinate. *c, c*. The Cotylédons expanded. *d*, The Plume. *e*, The Radicle.
- Fig. 2. The Seeds of Geranium, to show the manner in which they are dispersed. *f*, The Awns by which they are attached to the Pistil.
- Fig. 3. The common Receptacle of a Compound Flower.
- Fig. 4, and 5. Different shaped Florets of Compound Flowers.
- Fig. 6. The Wheel-form Corol of Verónica, to show the narrow division.
- Fig. 7. A Petal of common Crow-foot. *g*. The Nectary.
- Fig. 8. Shows a Tendril, *h*. Stipules, *i*. Glands, *k*.
- Fig. 9. A Verticil.
- Fig. 10. Head.
- Fig. 11. A Spike.
- Fig. 12. A Corymbe.
- Fig. 13. A Thyrsé.
- Fig. 14. A Raceme.
- Fig. 15. A Panicle.
- Fig. 16. Leaf-bearing.
- Fig. 17. An Umbel.
- Fig. 18. A Cyme.
- Fig. 19. A Bract, of Lime Tree (*Tília Europæa*) with the Capsules mature.
- Fig. 20. A Plant of Drósera, Sun-dew.



LECTURE III.

The first eighteen Classes, with their Orders, explained.

A PREVIOUS knowledge being acquired of the seven parts of *Fructification*, with all their variations; the different kinds of *Fulcra*, and modes of Inflorescence, being well understood; the pupil may proceed to the Classes.

A Class is the first and highest division of every system. It may be compared to a dictionary, in which all the words having the same initial letter are arranged together, every word may be compared to a genus; the classic character is constituted from a single circumstance, as the words are arranged by a single letter; this one circumstance must be possessed alike by every plant admitted into the Class, how different soever they may be in other respects. This single character is arbitrary, and has been taken from various parts of the fructification by different authors; some have chosen the petals, others the fruit; Linneus has made choice of the stamens, and

on their number and situation has founded his classes; he makes the excellence of the classic character to consist in it's greater or less approximation to the natural one. The classes called natural are those which contain plants agreeing in a variety of circumstances, such as habit, manner of growth, uses, and sensible qualities. The grasses are a natural class; the compound, the pea-bloom, the cross-form, the umbelled, and the verticilled plants, are natural classes; so are the ferns. Though some of Linneus's classes are natural, most of them are artificial; this, however, is, perhaps, of little consequence; his system has opened to our view a distinct knowledge of every plant that grows; it has given us a clear and ready method of referring an unknown plant, 1st, to it's Class; 2d, to it's Order; 3d, to it's Genus; 4th, to it's Species; and 5th, to it's Varieties. Before we had this ingenious system to guide us to a knowledge of the vegetable kingdom, all was confusion. Much acuteness had been displayed in the investigation of plants; but the labours of many ingenious men were rendered of little use from want of arrangement; they classed plants together which had scarcely any affinity,

from

from a fancied resemblance in imaginary virtues. Much useful knowledge has been lost to the world, almost all the medicines, and many of the arts of the ancients, we are now ignorant of, from their deficiency in the knowledge of Botany.

But, notwithstanding this deficiency in arrangement, we must not overlook the merits of the old writers on this agreeable science; to our own countrymen, Dr. Grew and Gerard, we ought to be particularly grateful. Dr. Grew made his investigations with an eye so penetrating and accurate, that much information may be found in his book on the anatomy of plants, particularly in the philosophical part of Botany; besides, it is pleasing to observe the coincidence of his opinions with those of Linneus, in regard to the use of the parts of fructification. Gerrard's descriptions are full and strong, and his language amusing; but, from want of arrangement, the student is bewildered, when he looks for a plant in his Herbal. The various systems of modern botanists have deservedly had their partisans; but it now seems generally allowed, that the works of Linneus are best calculated to enable us to attain a know-

ledge of botany. He has divided the vegetable kingdom into twenty-four Classes; the first ten Classes include the plants in the flowers of which both stamens and pistils are found, and in which the stamens, when arrived at maturity, are neither united nor unequal in height. These Classes are therefore distinguished from each other simply by the number of stamens in each flower, and may be known upon the first view by their numbers, as expressed by the words prefixed to the Classes: the first Class is known by the name of Monandria, which signifies one-male, or one-stamen, the stamens being the part of fructification, which Linneus calls the male; so that the numerical word joined to the word ándria forms the titles of the first thirteen Classes; an attention to which circumstance will make the task of committing them to the memory by no means difficult. An enumeration of the titles of the first thirteen Classes may be of use. Monándria, one-stamen; diándria, two-stamens; triándria, three-stamens; tetrándria, four-stamens; pentándria, five-stamens; hexándria, six-stamens; heptándria, seven-stamens; octándria, eight-stamens; enneándria, nine-stamens; decándria, ten-stamens; dodecándria, twelve-

twelve-stamens; icofándria, twenty-stamens; polyándria, many stamens.

The pupil should render himself familiar with the titles of the Classes compounded by Linneus, equally with those which are formed in his own tongue; for although, in most elementary works intended for the use of the english student of botany, an attempt has been made to bring english terms, and names of plants, into use in preference to those employed by Linneus, such language cannot answer the purposes of a general botanist; the pupil of these authors cannot converse with one of the Linnean school. In the translated works of Linneus he will learn a language which will enable him to communicate with botanists of all nations, and to understand any botanical descriptions of plants that he may meet with. They who have not industry sufficient to study those books will learn the science in but a superficial manner from any. The complaint, that the translated works of Linneus are hard, arises from not knowing how to study them. The method adopted in these Lectures may, I hope, enable my pupils to become proficient in this agreeable science with as little difficulty, and more amusement,

than from any of the various circuitous ways which have been made use of to level the subject to the capacity of ladies. Twenty years ago an english botanist, desirous to be acquainted with the science, might with reason complain of the hardness of the study; but at this enlightened period knowledge is so widely diffused, that there are few situations where books, with plates of explanation, are not to be met with, or some friend to be had access to, who is both able and willing to elucidate any obscure expression which may occur.

But to proceed with the Classes, the ten first of which are represented in Plate the Fourth, and are distinguished by the number of their stamens only; the eleventh class is called dodecándria, which signifies twelve-stamens. The reason of passing from ten to twelve is, that the number eleven has not been found sufficiently constant in any flowers to form a Class. In the genus *reséda* eleven stamens are sometimes found, but oftener more; yet they never exceed fifteen. The essential character of the eleventh Class depends on the flowers belonging to it having fewer than eleven stamens, and not exceeding
 nineteen;

nineteen : added to this may be, that in this Class the stamens are fixed to the receptacle ; whereas in the next, which has the title of twenty-stamens, icofándria, though not more determined in point of number than the preceding one, they are attached to other parts of the fructification : their position it is also necessary to attend to in the thirteenth class ; so that if we regarded only the titles of these three classes, we should find ourselves much confused. This is certainly a material defect in the system, which cannot be accounted for in a satisfactory manner. Linneus was evidently aware of the imperfection in the titles of these Classes, and has guarded against the inconvenience which would arise from the first character expressive of a decided number of stamens, by adding in the Key to his system the situation of their growth, by which circumstance alone we can distinguish these three classes one from the other. The twelfth class, icofándria, has generally twenty stamens, often more, which are inserted on the calyx ; there are also other more obvious characteristic marks, which may serve to distinguish this twelfth class from the following one, and which should be attended to, as this contains
most

most of the wholesome fruits, and the thirteenth chiefly consists of such plants as are poisonous; and it is curious to remark how justly the insertion of the stamens into the calyx may be relied on as an indication of a fruit free from noxious qualities. In the *Prunus* genus there are some species, as the *padus* and *lauro-cerasus*, in which every part, except their pulpy fruit, is poisonous; and of that we may eat with safety. This mark is also worth attending to in the plants of other classes. In the class *Pentándria Monogynia* there are many fruits, the juices of which are highly deleterious; but in *Ribes* (currant and gooseberry) we find a wholesome and grateful fruit, indicated by the circumstance of the insertion of the stamens into the calyx. This characteristic distinction of the class *Icosándria* is also visible when the fruits are ripe, their calyx frequently remaining like a little crown on their top, and, while in a fresh state, a skilful botanist may distinguish the insertion of the stamens on the inner part of it's divisions. The flowers of the twelfth class, *Icosándria*, have a hollow calyx of one leaf, the corol fastened by it's claws to the inside of the calyx, and, as was before observed, the
stamens

stamens placed on the inside of the calyx or corol. The thirteenth class, many *stamens*, Polyándria, has it's stamens inserted on the receptacle; their number being from twenty to one thousand in the same flower. This class is the last of the numerical ones, or, more properly, of those which have numerical titles, it having been shown that the characters of the three last classes depend nearly as much on the situation of the stamens, as those which are yet to be considered. The first thirteen Classes, with their Orders, should be well understood, before those which are more complicated are entered upon.

The Classes are all divided into what are termed *Orders*; these subdivisions of the first thirteen Classes are founded on the number of pistils, or on that part of fructification which Linneus calls the female. If a flower contains one of these females or pistils, it is of the first order; if it contains two, of the second; and so on to any number that it may contain. The Linnean term for the orders is formed from the Greek word, which signifies a female, joined to another word expressive of the number; so that, as Monándria signifies one-male or stamen, Monogynia

nogynia means one female or pistil; Digy'nia signifies two pistils, which refers the plant to the second order; Trigynia signifies three; and in the same manner the terms proceed to Polygynia, or many pistils.

The presence of the female part of fructification, or the pistils, is equally necessary with that of the male, or the stamens, to constitute a flower belonging to the first thirteen Classes; and it must also be remembered that the stamens, when at maturity, must be of an equal height. The essential character of the class Dodecándria, or the eleventh class, may be seen in the flowers of *reséda odorata*, *mignonne*; the stamens will be found to be not less in number than eleven, nor to exceed nineteen, and to be fixed on the receptacle. The distinction between the classes Icosándria and Polyándria, twenty stamens and many stamens, may be well seen in the bloom of apple, and in the flowers of the common crow-foot, *ranunculus arvensis*; in the apple blossom there are generally twenty stamens, often more, inserted upon the calyx, which is of one leaf, with the claws of the corol fastened on the inside of it; in the crow-foot the stamens are most numerous, and all attached

tached to the receptacle. The class *Didynámia*, two-powers, or the fourteenth class, is distinguished by the flowers which are contained in it having four stamens, two of them being longer than the other two; hence it is called the class of two powers. The grinning and gaping flowers belong to this class. There are, however, two such distinct natural assemblages of plants contained in it, that it would have been difficult to have brought them together from their affinity in any one circumstance, but that under which Linneus has arranged them, viz. the curious position of their stamens. This class contains two orders, which are strongly marked; the first *gymnospermia*, or that in which the flowers have their seeds naked, being contained in the bottom of the calyx; and the second order, *angiospermia*, having the seeds covered or contained in a pericarp. The whole appearance of the flowers belonging to these two orders is perfectly different: what can be more so than the fox-glove (*digitalis*), and lavender (*lavandula*), or thyme (*thymus*)? Yet the cross-form growth of the anthers, with the unequal position of the stamens, may be found in them all. The next class, *Tetradynamia*, four-

four-powers, or the fifteenth class, has six stamens, and is called the class of four-powers: these six stamens not being of an equal height, four being taller, and the two lower growing opposite to each other. This class contains the cross-form flowers, and is a really natural class. Linneus has admitted only one genus into it which can be at all objected against, that is the genus cleóme, in many species of which there are more than six stamens, and these not in the regular proportion of length, which gives the name of four powers to the class, so that it seems that the family of cleóme has no right to be admitted into it, unless the affinity of it's necessities to those of the cross-form flowers may be allowed a sufficient title. This class is divided into two orders, which are distinguished by the form of their pericarps, or seed-vessels; the first order having it's seed-vessels of the Silicle kind, the second of the Silique; the Silicle being furnished with a style, often the length of itself; the Silique with a style scarcely visible. The silicle of honesty, when mature, is a great ornament to the plant; from its shining appearance, like white satin, it has received it's botanical name of lunária, or moonwort.

moonwort. There is a good deal of variety in the forms of the filicle kind of seed-vessel; that of lunária is nearly round; there are others which are oval: the small filicle of shepherd's purse (thláspi) is triangular, and notched at the top, and resembles a little heart; the circumstance of being notched or plain makes two divisions of the filicle order, and thence renders the investigation of the généra belonging to it a less difficult task. The seed-vessel of lady smock (cardamíne) is a silique, and also that of radish (ráphanus). Some of these siliques form very pretty skeletons, in the manner of those holly leaves which have lain on the ground and been exposed to the weather in winter. The sixteenth class, Monadelphía, or one-brother hood, is so called from the flowers belonging to it having all their stamens united at the base into one company, surrounding the pistils. The stamens and pistils in the flowers of the sixteenth class form a beautiful part of the fructification; they stand like a little pillar in the centre of the flowers, from which circumstance Linneus, in his Natural Orders, has named these flowers column-bearing. The anthers have a marked character, which contributes to their

ornament, being shaped like a small kidney, and attached to the filaments by their middle in so slight a manner, that they appear rather to lie upon than to be fixed to them. The pistils are enclosed by the stamens, till they begin to advance towards maturity, when they burst forth, and form an elegant tassel, a little above the surrounding anthers: in the china rose (*hibiscus*) this tassel is particularly beautiful; the rich crimson pistil rises rather higher than usual above the golden anthers, which encircle it, and dividing into five filaments at top bends down it's round stigmas amongst them; these stigmas, at the period of maturity, having the appearance of the richest crimson velvet spangled with gold. The double *hibiscus* is that which is generally cultivated; but it is greatly inferior in beauty to the single, as, from the multiplication of it's petals, the other elegant parts of the fructification are excluded. As the sixteenth class is founded on the situation of the stamens, so are the orders on their number, beginning with the number three, and ending with that of eleven. The class *Diadélphia*, or two-brotherhoods, the seventeenth class, is perfectly natural, and the structure of the corol so remarkable,

remarkable, that the outer habits of it's flowers are sufficient to distinguish them from all others; but, according to the Linnean system, it is necessary to have recourse to the situation of the stamens, which he describes as being united into two sets; this classic character is, however, to be traced with difficulty, for what is termed one of the sets, consists of a single filament; and even this obscure mark does not exist in all the genera; indeed, so many are destitute of it, that Linneus has, on this failure, founded one of the subdivisions of the fourth order. He has, however, esteemed it of such essential consequence, that he has excluded from the class the genus *Sophora*, which has all the characters of the *Diadelphia* tribe, except that of the united filaments; and on this single deficiency he has separated it from it's natural tribe, and placed it according to it's number of stamens, which is ten, in the class *Decandria*, with the flowers to which it has no affinity in any other parts of the fructification. The orders, or secondary divisions of the seventeenth class, are founded upon the number of stamens, without any reference to their union; the singular structure of the corol having made it necessary to distinguish each separate part by

a name peculiar to itself: the broad spreading petal at the back of the corol is called the Banner; the side petals, the Wings; and the two petals, by which the stamens are enclosed, are termed the Keel, from the resemblance of their form to the keel of a boat. The shape, and other circumstances attending these different parts, are found of use in distinguishing the genera of this class from each other; but the calyx is of most service in this important office; it is to this class of plants that the legume seed-vessel belongs. The Legume is distinguished from the Silicle and Silique by its seeds being fixed alternately on each side the edges. The eighteenth class is called Polyadélphia, or many-brotherhoods, the flowers contained in it having their stamens united into distinct sets. St. John's wort (*hypericum*) shows the disposition of the stamens very plainly in that genus; they may, with very little attention, be taken off in small bunches: the orders of this class depend on the number of stamens, or, more properly, on the number of anthers in each flower, as some of the genera have five anthers on each filament: indeed, this is a circumstance which ought always to

to be attended to, the ANTHERS and STIGMAS being the essential parts of the STAMENS and PISTILS. If they are present, it is sufficient to place the flower, they belong to, in the class or order to which their number refers it.

LECTURE IV.

*Examination of Flowers belonging to different Classes.
The Classes 19, 20, 21, and 22, explained.*

As a means to impress the knowledge which has been acquired upon the minds of my pupils, and in order to render their studies more amusing, I recommend to them to attempt to refer some plants of simple construction to their classes and orders. The young botanist is frequently discouraged in his early endeavours of this kind by the flowers on which he fixes for his experiments; the whole tribe of grasses should be avoided, as they require a peculiar method of study, and considerable proficiency in the knowledge of botany, to render them easy of access. The state of the flower, when examined, is also an important circumstance; the best time to examine the number of stamens is immediately before the corol expands; after the anthers are mature it is difficult, in many flowers, to distinguish their number. The *hippúris vulgáris*,
mare's

mare's tail, from the frequency with which it presents itself to the eye of the young botanist, generally attracts his attention as an object of investigation, and, from the simplicity of it's construction, seems a proper one for that purpose, so far as respects the characters of it's class and order; it has neither calyx, corol, nor seed-vessel, and those parts most essential to fructification few as possible, there being only one stamen, one pistil, and one perfect seed; hence easily referred to the first class, Monándria, and the first order Monogynia: yet some difficulty is liable to occur from the mode of inflorescence, or position in which the fructification is placed upon the flower-stalk. A number of florets, containing each a stamen and pistil fixed at the base of a small-pointed leaf, grow round the stem in a whorl, and have, to an inexperienced eye, the appearance of forming only one flower, though, on accurate examination, each small floret will be found perfect in itself, possessed of those parts which are sufficient to constitute a single flower.

Cánna, flowering-reed, may be more readily referred to the class one stamen, and order one pistil, as there are not any difficulties

attending it's mode of inflorescence. The verónica, common speedwell, belongs to the class Diándria and order Monogynia. Most of the grasses may be found in Triándria, three stamens, but are of a structure too difficult for the investigation of the young botanist. Crocus is a good specimen of the class Triándria, but not so easily referred by it's characters to the order Monogynia, the deep divisions of the stigma giving the appearance of three pistils; if, however, the parts of fructification are separated, to do which the root must be taken out of the ground, one very long pistil within the tube of the corol will be found. The common plaintain (plantágo) may be referred to the class Tetrándria and order Monogynia, four stamens, one pistil, without much difficulty, if examined before the anthers are arrived at maturity. Several flowers of the same kind should be collected at their different periods of growth; and it must be remembered, that the four stamens must be of equal heights to give the flower a place in the class Tetrándria. In the flowers of plaintain the anthers are placed upon very long slender filaments, which, previous to the maturity of the anthers, lie closely doubled down

down within the corol to preserve them from injury until they are ready for expansion. In this state it is curious to observe the unfolding of the filaments, if touched slightly with a fine needle. It is not easy, in the flowers of the umbel-bearing plants, to find the stamens in a proper state for investigation; they also differ in number, in which case the flower, which terminates the umbel, is to be examined, and, according to the number of stamens contained in that, is to be classed. The difficulty of variety in the number of stamens in the same species too frequently occurs in the flowers of the class Pentándria, and is a perplexing circumstance to young botanists; but as nature commonly preserves a certain proportion through all the parts of the same work, the class to which a flower belongs may generally be discovered by attending to the numbers of the other parts of fructification. Should a flower be found which has it's calyx divided into five parts, and it's corol consisting of five petals, though it's stamens should exceed or fall short of the number five, it may be concluded, that it belongs to the fifth class: and if a few more flowers of the same species, or even of the same plant, be

examined, it will be seen that five stamens are the most constant number belonging to such flowers; and they may be referred to the class Pentándria without hesitation. The umbelled plants are improper subjects to begin with from the minuteness of their parts of fructification. The larger sorts of flowers, and those of the most simple construction, should be made choice of, and when they, with their classes and orders, are well understood, the pupil may proceed to more complicated kinds; the honeysuckle (*lonicéra*) and lungwort (*pulmonária*) are simple flowers of the class Pentándria and order Monogynia, five stamens and one pistil. The snow-drop (*galánthus*), horse-chestnut (*ésculus*), and me-zéreon (*daphne*), are specimens of the classes Hexándria, six stamens, Heptándria, seven stamens, Octándria, eight stamens, and of their first orders, Monogynia, one pistil. The class of nine stamens, Enneándria, contains only six génera. There is but one british species known which belongs to this class, that is the bútomus, or flowering rush, and this is not to be commonly met with. The wood-forrel (*óxalis*) is an elegant specimen of the class Decándria, ten stamens, and the order Pentagynia.

Pentagynia, five pistils. But there are some plants placed in this class which generally form a stumbling-block to the young botanist; an instance of this is found in some of the species of the family of Lychnis. By a strict observance of Linneus's rules the lychnis dioica, or two house, should not be placed in the tenth class, as the characteristic mark of the class Decándria requires the presence of both stamens and pistils in the same flower: however, he has himself placed it there, being found to agree with the rest of it's family in every particular but that of it's stamens and pistils being on the same plant; rather than separate it from them, he has taken this circumstance for it's specific character. This, and a few more instances of the same kind, may certainly be considered as defects of the system; but the inconvenience that might arise from such a violation of the general rule, by which the classes are characterized, is obviated, as much as can be, by being noted whenever such contradiction occurs. The ly'thrum (willow-herb) belongs to class Dodecándria, twelve males, and is liable to vary in it's number of stamens, which shows the necessity of examining many flowers of
the

the same genus: however, as the classic character is not derived solely from the number of stamens, such variations may be of less consequence. The hawthorn (*cratægus*) and pheasant's eye (*adónis*) exhibit marks of the classes Icoándria, twenty males, and Polyándria, many males, the hawthorn having its stamens fixed to the calyx, and those of the *adónis* being placed on the receptacle. In the class Didynámia, two-powers, Tetrady-námia, four-powers, and Monadelphía, one-brotherhood, the orders or subdivisions, no longer depending on the number of pistils, will require some farther explanation. In the fourteenth class, two-powers, the génera are divided into two orders, the first distinguished by the seeds being placed within the calyx without any other covering; the second by the seeds being contained by a pericarp, or seed-vessel: from these different circumstances the orders derive their names of gymnosper-mia, seed-naked, and angiospérnia, seed-covered. The dead-nettle (*lámium*) and snap-dragon (*antirrhinum*) are good specimens of both orders, and also of the class two-powers. The orders of the fifteenth class, Tetrady-námia, four-powers, are marked

7

by

by the form of their seed-vessels; the whitlow-grass (drába) is a specimen of the first order; its seed-vessel being a Silicle refers it to that division. The seed of purple rocket (hésperis) being contained in a silique, that genus belongs to the second order. We find in the class Tetradynámia many of our esculent vegetables; some of which, as the water-cress (fisy'mbrium) and mustard (finápis), are used without having gone through the process of cookery; others are rendered mild by boiling, as cabbage, turnep, brocoli, cauliflower, and some others, all of which are the produce of cultivation from one genus, Brássica. The change produced in vegetables by the art of gardening is a part of the subject of botany highly curious and amusing.

The flowers of the three classes, Monadélphia, Diadélphia, and Polyadélphia, one brotherhood, two brotherhoods, and many brotherhoods, are now to be considered. The characters of these classes are strongly marked: the geranium and mallow are specimens of the Monadélphia class; in attempting to take off the stamens, that union of the filaments from whence the name of One Brotherhood is derived, may be distinctly seen;

seen; and though apparently separated at the top they will be found firmly united at the base. The orders are characterised from the number of stamens found in each flower; the geranium and mallow, having many stamens, are arranged in the order Polyándria. The form of the papilionaceous, or butterfly, tribe of plants is so evidently different from that of all others, that no additional mark is requisite to distinguish them; but in referring these flowers to the classes established by Linneus, the systematic character of Diadélphia, two brotherhoods, must be examined: this he has made to depend upon the union of the stamens into two sets, which would lead the botanical student to expect a more equal division of the filaments than does in reality exist; the pea (*pisum*), having a large flower, will give a just idea of the true position of the stamens; these are ten in number, nine of which are separated from the tenth, and closely united at the base. On this separation of the tenth filament Linneus has founded his classical character, not, however, unapprised of its deficiency, as in several genera he has made the connexion of all the stamens the mark by which he collected them under a subdivision

subdivision of one of his orders which derive their character from the number of stamens. In common broom (*spartium scoparium*) the ten filaments are all united; they, however, might, perhaps, with more propriety, be termed two sets than those of the pea, five of the stamens obviously rising a quarter of an inch above the other five. There is a curious circumstance respecting these flowers which is worth attending to: the upper set of males, or stamens, does not arrive at maturity so soon as the lower; and the stigma, or head of the female, is produced amongst the upper or immature set; but as soon as the pistil grows tall enough to burst open the keel-leaf, or hood of the flower, it bends itself round in an instant like a French horn, and inserts it's head, or stigma, amongst the lower or mature set of stamens, as may be seen by touching the keel-leaf; the pistil continues to grow in length, and in a few days arrives again amongst the upper set by the time they become mature. This wonderful fact we owe to the accurate research of the much-lamented author of the Botanic Garden, to whom the world is indebted for an extensive variety of knowledge, both amusing and

and useful, and from which benefit will be derived to mankind to the latest ages.

In some généra belonging to the class Polyadélphia the character of many brotherhoods is clearly defined, in others it is less obvious; in the genus Hypéricum, St. John's-wort, it is easy to take off the stamens in distinct little bunches. In the orange, lemon, and citron, all of the genus Citrus, the appearance of the stamens differs so much from that of the hypéricum that a young botanist would not suppose them to be of the same class. However, on investigation, the stamens will be found separated into small bunches, so as to entitle the family to a place among the many brotherhoods.

The most intricate class in the whole system must now be considered: the curious and beautiful construction of the flowers contained in it will, however, amply repay the labours of the student. The class Syngenésia, confederate males, or united anthers, is founded on the very peculiar situation of the anthers, which are joined together in the form of a cylinder, while the filaments remain separate. A slight pressure at the top of this cylinder of anthers causes the filaments to
bend

bend down, and distinctly shews their want of union: the number of stamens so united is five; they form a ring round the pistil, which rises in the midst of them, and seems conscious of the homage she is receiving. This class consists of what are called the compound flowers, and is certainly a natural one, if we except a few *généra* which are contained in the last order, and which are placed in this class from the single circumstance of having their anthers united in a cylinder; one of these *généra* is the *viola*, under which the violet and pansie are ranked: this must be allowed to be a fault in the system; but at present it is our business to consider only the compound flowers: Linneus makes the essence of a compound flower to consist in the union of its anthers into a cylindric form, one seed being placed on the receptacle beneath each floret. A compound flower is so called from being composed of many small flowers or florets, which are fixed on a common receptacle, and enclosed by a common calyx. These florets vary greatly in their contents, the stamens and pistils, and also in the form of their corols, which in some florets is tubular, in others flat, which is called tongued. In the same flower some-
times

times the border of the corol is wanting, and sometimes there is not even a tube. On the variety of form in the corol is founded, in part, the generic character. On the florets bearing stamens or pistils, or both, are founded the first four orders. If all the florets of a compound flower are found to contain stamens and pistils, it must then be referred to the first order: if some of it's florets contain stamens and pistils, and others only pistils, you must look for your flower in the second order: to the third it will belong if the florets in the *centre* have both stamens and pistils; and if those in the circumference be destitute of either. The fourth order depends also on the florets in the centre having both stamens and pistils; but from some defect in the pistils, producing no seed, the florets in the circumference having only pistils, and producing seed. The fifth order is not distinguished by any circumstance belonging to the stamens and pistils, but is marked by the florets being separated from each other, and being enclosed in a partial calyx, all the florets being contained in a common one, so as to form one flower. The character of the sixth order is derived from the form of it's flowers being simple.

simple, which perhaps ought to have excluded them from this class; but as they agree with the compound flowers in the essential character of the united anthers, Linneus has placed them in it; and as the principle of the system on which he has founded his classes does not pretend to make them natural, there is not, perhaps, any great objection to his having done so; and while we receive so much amusement from his arrangement of the vegetable kingdom, we are bound to look with candour upon any small defects which may appear in it. His life was spent in laborious research into natural history, by which the botanical world has been so materially benefited, that it ought at least to pay the tribute of gratitude to his memory. However, gratitude is not exclusively due to him; much was done by his predecessors; and both amusement and instruction may be derived from the ingenious system of Tournefort; but at present we are to think only of Linneus as our great master. The characters of the orders of the class Syngenesia, United Anthers, are too complex to retain in the mind without having examined some flowers belonging to them. The pupil should therefore

collect a variety of the species arranged under those divisions, and, by dissecting them, impress upon his memory the different characters by which the orders are distinguished. The dandelion (*leóntodon*), thistle (*cárduus*), are proper flowers for investigation; it will be also expedient to examine some violets and pansies as examples of the order of simple flowers. There are some flowers of the fourth class, *Tetrándria*, four stamens, which are liable to perplex the young botanist in his search after compound flowers: in outer appearance the mode of inflorescence in scabious (*scabiósa*) nearly resembles that of the compound flowers, although, on examination, there will be found very marked distinctions between them. The scabious, and several other génera of the same habits, have their *four* stamens separate; the compound flowers, as is seen in the thistle (*cárduus*), have their *five* anthers united in a cylinder: there is also another difference, these flowers of the fourth class have the florets, of which they are composed, attached to the common receptacle by a small peduncle, or foot-stalk; the florets of the compound flowers are sessile, or fixed to the common receptacle by their base, without
the

the intervention of a peduncle ; the scabious, and that tribe of flowers which have not the essential mark of the United Anthers belonging to the compound flowers, are called aggregate. The flowers of both the thistle and dandelion, containing both stamens and pistils, refer them to the first order. Daisy (*béllis*), having the florets of the centre furnished with both stamens and pistils, and those of the circumference with pistils only, has a place in the second order. Blue-bottle (*centauréa*) has both stamens and pistils in it's central florets, and florets without either form the circumference ; it is therefore of the third division. The fourth order not only derives it's character from the absence or presence of the stamens and pistils, but in addition to the necessity that the central florets should contain both, and the florets of the circumference only pistils, it is essential that the florets or the centre should be destitute of seeds, and that the florets of the circumference should be found to contain them ; which circumstance distinguishes the fourth from the second order ; and this distinction may be seen in the common marygold (*caléndula*) and daisy, which belong to those respective divisions.

The fifth order is readily understood; each floret should be contained in a separate calyx, and all together collected into one large common calyx; of this, globe thistle (*echinops*) affords a specimen. The character of the sixth order consists in the single circumstance of the united anthers, there being not one compound flower of this division. The stigmas of the violet and pansie are worthy of observation: these flowers are both of the genus *Viola*, which is separated into two divisions from the peculiarity of their stigmas; that of common violet being reflected into a simple hook, and that of the pansie (or three-coloured *viola*) being round and perforated. *Jasione*, or sheep scabious, is placed in this order of simple flowers, to which it certainly cannot belong, being composed of many florets; nor is there any circumstance respecting it's fructification, which gives it any pretence to be classed with the compound flowers, except that of it's five anthers being slightly connected at their base, for they are not united in a cylinder: from the first view of this plant it seems to be of the tribe called aggregate, but, on examination, it differs essentially from that order of plants in the numbers
of

of it's fructification and other circumstances. The Jasiona has proved perplexing, even to proficient in botany; nor are the difficulties which occur in it's construction yet explained in a satisfactory manner.

There is a curious circumstance in regard to the calyx of most of the compound flowers, though not belonging to all, which is worthy of attention. When the florets become mature, they burst open the common calyx, which contains them; as soon as the stamens and pistils of these florets have done their office, they wither with the corols, the common calyx then rises, and encloses the remaining parts of fructification, till the seeds arrive at that state of ripeness which makes them ready for dispersion; the hairy down, by which they are crowned, then expands, and again bursts open the calyx, so as to bend it's leaves quite back, and, by the help of this down, the seeds are carried by the wind to a considerable distance. Those compound flowers which have their seeds furnished with a downy pappus, take a variety of elegant forms; and the class of United Anthers, though difficult at first to study, amply repays our trouble in attaining a perfect knowledge of it, from the

curious mechanism of it's flowers. The structure of the stamens and pistils of the class Gynándria, or twentieth class, is so extraordinary as to be supposed by Linneus to occasion the unusual appearance of the flowers belonging to it. The órchis tribe, passion-flower (passiflóra), and árum, wake-robin, are of this class; the essential character of which is the stamens growing on the style, or on the receptacle elongated into the form of a style, bearing the pistil with the stamens, and becoming a part of the pistil, which part must be well understood before a distinct idea of the situation of the stamens can be obtained. This class contains nine orders founded on the number of stamens in each flower. The first order, which is called Diándria, or two-stamens, is natural; the génera differing from each other almost only in the Nectary. The structure of the fructification of this order is very singular; for the germe, always beneath, is contorted: the petals are five, of which the two inner converge, so as to resemble a helmet: the under lip constitutes the Nectary, which occupies the place of the pistil and sixth petal: the style grows to the inner margin, and can scarcely be distinguished

tinguished with it's stigma: the filaments are always two, ^{at} very short, elastic, and bearing two anthers, which may be divided like the pulp of a citron; they are enclosed in little cells opening downwards, and fixed to the inner edge of the Nectary; the fruit is a one-celled capsule, with three valves gaping at the angles. The généra of this first order afford flowers which, in outward appearance, so nearly resemble the animal kingdom, as to have occasioned a variety of fanciful names being given to them. The family of óphrys contains several species, which resemble a variety of insects, the Nectary being the principal feature in their different forms; sometimes their flowers resemble a gnat, a butterfly, a bee, a fly, or a bird: the Nectary of the bee-óphrys is a large thick leaf of a footy colour, and, when seen in the light, seems varied with three bright yellow circular lines, with rust-coloured spaces between them, and so exactly represents a drone, or bee, that it might be mistaken for them. The flowers of the genus *Cypripedium* are supposed to resemble the form of a lady's slipper; and thence the plant has it's name. This curious tribe of flowers requires very accurate

investigation to enable us to understand their various parts, and affords much interesting occupation to those who take the pains to study it. The eight remaining orders of this class are known by their number of stamens. The structure of the parts of fructification in the arum is most extraordinary, and not to be found in any other genus. The receptacle is enlarged into a naked club, with the germes at the base. The stamens are affixed to the receptacle, amidst the germes, which is called by Linneus a natural prodigy: the most eminent botanists have been perplexed by this singular flower. The younger Linneus was of opinion, that every anther was to be considered as a distinct floret, and thence that the genus ought to be removed from the class Gynándria to the following one Monoëcia, or stamens and pistils separate. I cannot pretend to decide on this subject, but hope, as this opinion of the younger Linneus opens a new principle of investigation, some ingenious botanist of the present age may be able to discover the secret of the wonderful mode of fructification found in this family. An english botanist ought certainly not to remain ignorant of a plant which contributes so much to the beauty of
of

of our hedge-banks during the period of flowering, and continues to attract his eye by the brilliancy of its scarlet berries through most of the months of autumn. The following class, Monœcia, the twenty-first class, contains such plants as have their stamens and pistils in separate covers, but growing on the same root; hazle (*córylus*), nettle (*urtíca*), are instances of the Monœcia class, or class of one-house: the orders of this class are derived from the number, union, and situation, of the stamens, circumstances which constitute the chief characters in the classes, where the stamens and pistils grow together in the same cover. There are eleven orders of the class one-house, which are distinguished by the same names that are given to the preceding classes. Hazle (*córylus*) having several stamens in each scale of it's ament, or catkin, is placed in the order Polyándria, many stamens; nettle (*urtíca*) in Tetrándria, four stamens; and cypress (*cupréssus*), which is also of this class, is arranged under the order Monadélphia, one-brotherhood, having it's stamens united at their base, like the flowers of that class, which might lead a young botanist to place it among them if he did not keep in
his

his mind the essential circumstance of the first twenty classes, viz. their having their stamens and pistils in one flower. To this class of one-house belongs the nutmeg (*myristica*), for the knowledge of which flower the world is indebted to Dr. Thunberg, who has given a description of the genus from the real flowers, whereas the former characters were taken from a plant which had no affinity to the true nutmeg. The class *Dioecia*, or two-houses, contains those flowers which have their stamens growing on one plant, and their pistils on another. *Vallisneria* belongs to this class: the wonderful progress of the flowers of this plant seems to furnish a strong argument for the sensation of plants; but this is not the time to enter into the discussion of that part of our subject. Hemp (*cannabis*), hop (*humulus*), mercury (*mercurialis*), and willow (*salix*), all belong to the class two-houses: there are fifteen orders contained in this class, characterized from the same circumstances with those of *Monœcia*, or one-house, and named by words expressive of those circumstances. Great fault is found with the contradictions that this occasions; and certainly this part of the system is open to censure,

and in all probability would have been corrected, had Linneus's health, during the latter part of his life, permitted. Alterations have been made in these classes of late years, which are pretty generally received; and as the liberal spirit of the age inclines his successors in this delightful science rather to render his labours perfect, than to hold out his failings to ridicule, we may hope that time will give us his system as free from defect as such an undertaking can be expected to be.

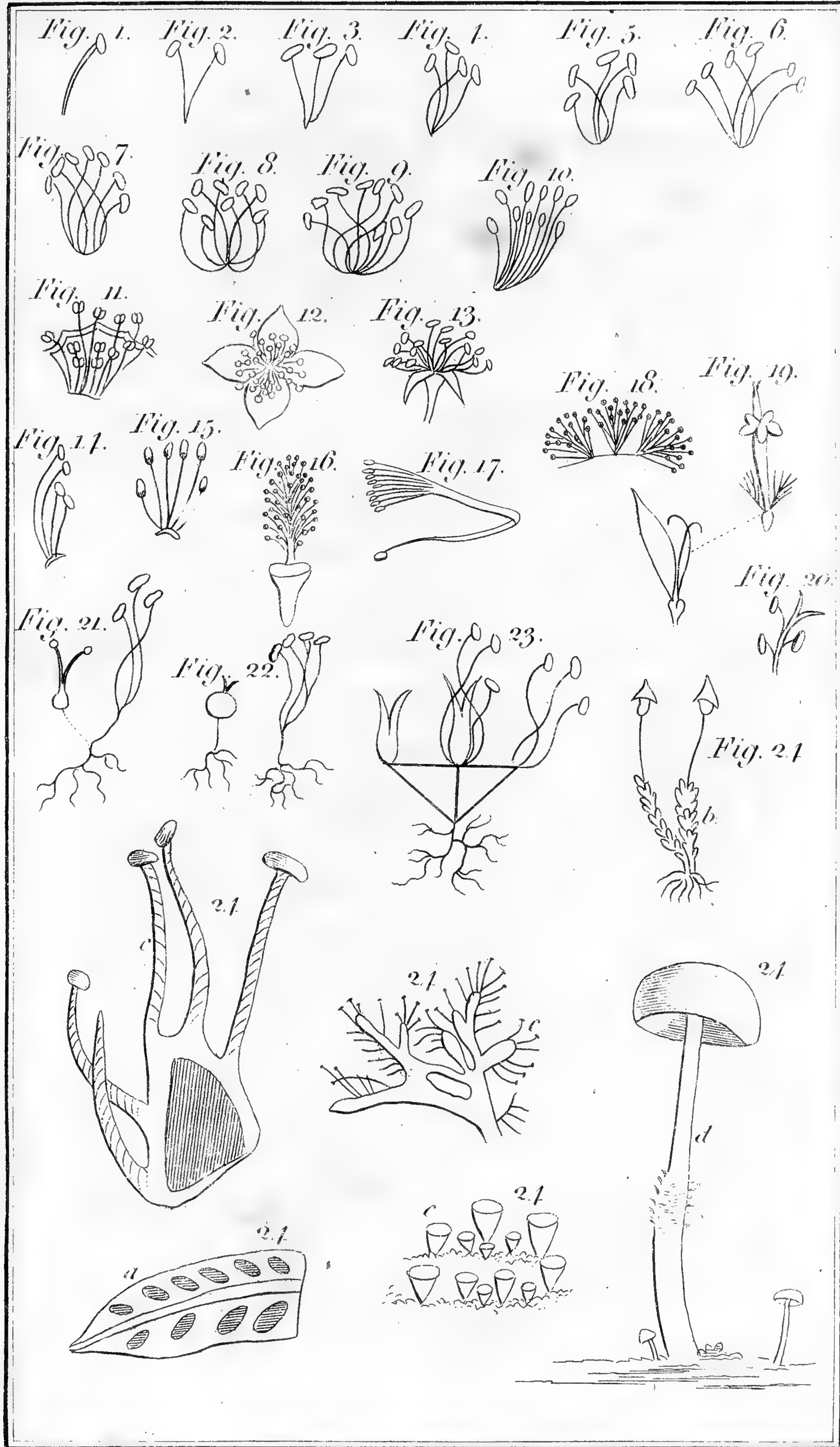
The mistletoe (*viscum*) belongs to the class two-houses: this is a parasitical plant, or one which lives upon the juices of another vegetable, without fixing its roots into the ground: it can only be propagated by sticking the seeds upon the bark of trees, into which they strike their roots in a curious manner. A seed first sends out three claws, which fix themselves on the bark of the tree, and begin to separate at the centre of the seed, as if each claw was to become a distinct plant; but in a year or two the three claws become swollen and enlarged enough to meet at their points, and are so strongly united, that they make the foundation but of one plant; the place of their first joining in the
centre

centre opens and divides, so that three distinct branches appear spreading from the root; after this, it proceeds to blossom and bear fruit, and will live to a great age, agreeing very well with it's foster tree, which it ornaments, in grateful return for the support which it receives: it grows mostly on apple-trees, but is sometimes found on the oak, though rarely, and on several other kinds of trees; the seeds are enclosed by so viscous a pulp, that they readily adhere to other vegetables, on which they are frequently dropped by birds, and thus the species is propagated.

EXPLANATION OF PLATE IV. PART I.

OF THE CLASSES.

- Fig. 1. One Stamen, Monándria.
- Fig. 2. Two Stamens, Diándria.
- Fig. 3. Three Stamens, Triándria.
- Fig. 4. Four Stamens, Tetrándria.
- Fig. 5. Five Stamens, Pentándria.
- Fig. 6. Six Stamens, Hexándria.
- Fig. 7. Seven Stamens, Heptándria.
- Fig. 8. Eight Stamens, Octándria.
- Fig. 9. Nine Stamens, Enneándria.
- Fig. 10. Ten Stamens, Decándria.
- Fig. 11. Eleven to Nineteen Stamens, Dodecándria.
- Fig. 12. Not less than Twenty Stamens placed on the Calyx,
Icosándria.
- Fig. 13. Many Stamens placed on the Receptacle, Polyándria.
- Fig. 14. Two-powers, Didynámia.
- Fig. 15. Four-powers, Tetradynámia.
- Fig. 16. One-brotherhood, Monadélphia.
- Fig. 17. Two-brotherhoods, Diadélphia.
- Fig. 18. Many Brotherhoods, Polyadélphia.
- Fig. 19. United Anthers, Syngénesia.
- Fig. 20. Stamens on the Pistil, Gynándria.
- Fig. 21. One-house, Monœcia.
- Fig. 22. Two-houses, Diœcia.
- Fig. 23. Polygamies, Polygámia.
- Fig. 24. Fructifications concealed, Cryptogámia. *a.* Fern,
b. Moss, *c.* Lichens, *c**. fringed Lichen of the
natural size, *c.* the same magnified, *d.* a fungus.



LECTURE V.

Class Polygámia explained; Caprifigation. Class Crypto-gámia explained.

THE essential character of the class Polygámia consists in the plants, of which it is comprised, having, on the same root, flowers which contain stamens and pistils within the same cover, and also other flowers, which bear either stamens separately, or pistils separately; sometimes flowers are found on the same plant, which contain stamens and pistils, stamens without pistils, and pistils without stamens: the presence of the first kind marks the class; without flowers, which contained both stamens and pistils, the plant would belong to either the class one-house, or two-houses. The plants of the Polygámia class are many of them dispersed, by botanic writers of the present age, into Monoecia and Dioecia; so that probably that class will soon be banished from the system. The orders, of which there are three, depend on the

the disposition of the stamens and pistils in the flowers of the different plants. The fig (*ficus carica*) long perplexed the botanic world, to discover by what mode the dust of the stamens could be conveyed to the pistil, as these parts of fructification are enclosed within separate fruit, this fruit not being a seed-vessel, but a receptacle surrounding the stamens and pistils, which grow upon it; and some of them so closely immured, that the manner in which they are fertilized was incomprehensible. At length it was discovered, that a kind of gnat deposited it's eggs in these receptacles, and, by going from one kind of fig to the other, was supposed to bear on it's wings the anther dust of the stamen-bearing fig to the stigmas of that which contained only pistils. This process performed by the gnat was called caprification, and was so strongly believed to be essential to the ripening of the cultivated fig, that the inhabitants of the Archipelago, who trade with their figs, spent much time in observing the critical moment of the gnat issuing out of one kind of fig and entering the other, and sometimes gathered the fruit, in which the gnat was contained, and brought it to that which they wished to have

have fertilized. Mr. Milne gives a long and curious account of the process of caprification; but it is difficult to assent to the truth of the necessity of it, there appear to me so many objections against it. First, there is not any species of fig known, which bears pistils only; consequently not any which is not sufficient in itself to its own fertilization. In Provence and Spain the cultivated fig is proved to be so by being brought to perfection without the process of caprification. Secondly, these fruits generally open at the top, at the time that their stamens become mature; a circumstance analogous to all water plants, which rise to the surface, when their stamens are ready to scatter their dust, in order that they may disseminate it in the open air; an element which seems necessary for that process.

The process of caprification has been esteemed a powerful argument for Linneus's system of the anther-dust being essential to the perfect production of seed, and made use of as such by many intelligent authors. The late ingenious Dr. Darwin found so many difficulties to be surmounted in the belief of this process, that he ventures to refuse his assent to it. He conjectures that those figs,

H

which

which have their receptacles closed on all sides, might be vegetable monsters cultivated for their fruit, as those grapes and barberries are, which are without seed; and that the process of caprification might be of imaginary use, or that it might contribute to ripen the fruit, as those apples ripen sooner which are wounded and penetrated by worms in our own climate; and this seems probable from what is told us by Mr. Milne concerning the figs of Malta; one kind of which, he relates from Tournefort, bears two crops in the same year, the figs of the first being sweet, and arriving at perfect maturity *without* the assistance of caprification; those of the second being much smaller, and not ripening at all, if this process be not followed. Tournefort adds, that the figs in Provence and in Paris ripen sooner if they are pricked with a straw dipped in oil, which seems to make it probable that the puncture of insects in caprification may cause the second crop of fruit to arrive earlier at maturity in Malta; that is, before the inclement part of the season comes on; as in our climate the plums and pears wounded by insects frequently ripen some weeks sooner than the others, to which that circumstance

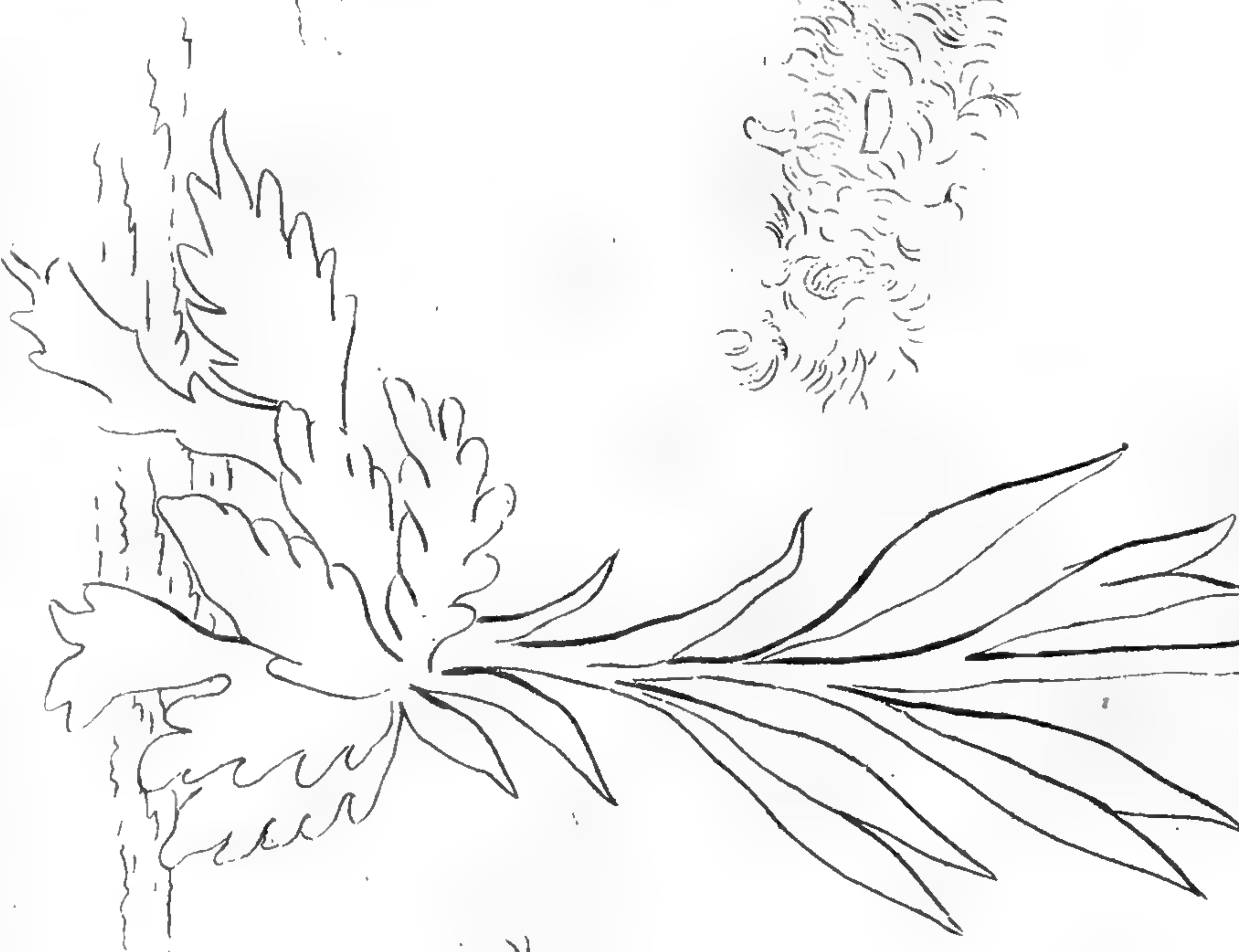
circumstance has not occurred. The fig-trees cultivated in our own country produce two crops; the first upon shoots of a year's growth, which appears in spring, and arrives at maturity in the course of the summer; the last crop does not put forth till autumn, and proceeds from the shoots of the preceding summer. This crop can never ripen in our climate, and is carefully pulled off by the gardeners. It would seem that the tree has not power to bring two crops to perfection, even under the influence of more benignant skies, as at Malta, as the fruit obtained by the process of caprification is scanty and of bad quality.

The necessity of this operation has, however, universally obtained belief in the east; but, in this inquiring age, we cannot easily assent to facts to which we think both reason and analogy opposed. If a fig be cut open at the time when it gapes at the top, the florets may be seen arranged on the inside in a beautiful manner, and there may be found several of the stamen-bearing kind in the state of dispersing their dust.

We are now arrived at the twenty-fourth or last class of the Linnean system, the class

Cryptogamia, or clandestine marriage, the grand desideratum of botany, as the plants of which it consists have their fructification so obscure, that there are but few généra in which it has yet been distinctly seen. This class includes all those plants, which have a structure different from those comprised in the other three and twenty classes, and is divided by Linneus into four orders, the filices, ferns; musci, mosses; algæ, wrack, or feed-weed; fungi, funguses. The little knowledge, that has hitherto been obtained of these numerous tribes of plants, has been considered a great reproach to the science of botany. Perhaps the system of Linneus may have retarded a more distinct arrangement of them, that being founded upon the parts of fructification, which in most of the généra belonging to the class Cryptogamia are so difficult to ascertain. The ferns are defined to be plants bearing their flowers and fruit on the back of the leaf or stalk, which in this tribe of plants are the same, the stem not being distinguishable from the common foot-stalk, or rather mid-rib of the leaf: so that, in strict propriety, the ferns may be said to be without stems. The stem and leaf thus
united

Vegetable Lamb



Polypodium : Barometz.



united are termed by Linneus a frond. The seed of the ferns affords an instance of the most curious mechanism, and will be well worthy the attention of proficients in botany. All that is necessary for the pupil in that science is an acquaintance with an outline of the characters of the généra contained in the class Cryptogamia, of many of which a clear idea may be obtained by studying plates of their extraordinary structure given by various ingenious artists. The true sago powder is said to be made from the pith of a species of fern, *Cy'cas circinalis*; and that great vegetable curiosity, the tartarian lamb, is now known to be the root of the polypodium barometz, which, being pushed out of the ground in it's horizontal situation by some of the inferior branches of the root, bears some resemblance to a lamb standing on four legs, which is increased by the thick yellow down, by which it's root is covered. And, indeed, stories so extraordinary of the appearance of this fern have gained admission into the works of authors of so much repute, as to have given the tale a degree of credibility far beyond it's deserts.

Many things have gained the character of monsters from want of that investigation,

which ought always to be given to histories of a marvellous kind. In former ages we might probably have received from travellers a grave account of a tree, bearing gloves, and stockings, and caps, growing in Caffraria; the report of which was so general as to excite the attention of Dr. Thunberg, when travelling in that country. With his usual assiduity he unveiled this mystery, and found all this wearing apparel to be nothing more than the downy leaves of the *Bupleurum giganteum*, which, by a little dexterous management, were converted into those various articles, which were asserted to grow upon the plant.

In some countries the roots of different species of fern are used in the process of making bread. Captain Cook relates, that in New Zealand the common fern (*pteris aquilina*) is chosen for that purpose. Bread is also made from a species of fern by the inhabitants of Palma, one of the Canary isles, when corn is scarce, and is said to be little inferior to that made from wheat.

But to proceed to the second order of Cryptogamia. The mosses (*musci*) are divided according to their anthers, being calyptred, or not calyptred, being on the same, or separate plants,

plants, and having the pistil florets solitary, or growing in cones. Their seeds have no cotyledons, or any proper coverings. Linneus doubts, whether what he has called anthers might not, with greater propriety, take the name of capsules, and their dust be considered as true seeds, as in *Buxbaumia*, and some other genera, have been seen within the covers real dust-bearing anthers depending from their filaments, gaping at the top to discharge their dust on the fringes, as on pistils. Dillenius, professor of botany at Oxford, was the first who attempted an arrangement of the mosses. There are many curious circumstances belonging to the tribe of mosses, one of which is their having this singular property, that, though preserved dry for several years, upon being moistened they resume their original verdure, and probably their power of vegetation; an experiment easy to be made. The fructification of the flags, or algæ, is so obscure as not to admit of precise arrangement; they are only divided into terrestrial and aquatic, and the genera distinguished by their outer structure. This order contains many curious and useful vegetables; among the latter there is none more worthy of notice than the lichen *rangiferinus*. This little plant

may be properly esteemed the support of millions of mankind, as it is the sole food of the rein-deer; without which serviceable animal, the inhabitants of the northern regions could not exist. The rein-deer furnishes them with milk, butter, and cheese, draws them in sledges with ease and swiftness over vast tracts of land buried in snow; his flesh affords them food; his skin, clothing; his tendons, bow-strings; and his bones, spoons. All these benefits would be lost, had not nature formed this lichen so as to enable it to vegetate beneath the snow, by which it is commonly covered to a great depth: the rein-deer, however, contrive to dig through the snow with their feet and brow-antlers, till they arrive at their food. To the common name of rein-deer lichen, by which this plant is known, it has therefore the fullest claim. The whole tribe of lichens possess qualities of which various uses are made; different species being used in dying reds and purples. Dr. Thunberg relates, that the Japanese gather a species of ulva, which is one of the algæ, and, clearing it from all impurities, dry and reduce it to a fine powder, which they eat with boiled rice, and sometimes put into soup. There are other species also of them, which are used for

food

food or pickles by ourselves. The formation of some of the *généra*, which belong to the aquatic division of this order, is worthy of remark. The *conférva ægagrópila* is of a globular form, from the size of a walnut to that of a melon, much resembling the balls of hair found in the stomachs of cows. It does not adhere to any thing, but rolls from one part of the lake, on which it lives, to another. The *conférva vagabunda* has it's name from it's wandering habits. It dwells on the european seas, travelling along in the midst of the waves. These may not improperly be called itinerant vegetables. In the same manner, the *fucus natans* strikes no roots into the earth, but floats on the sea in extensive masses, and may be said to be a plant of passage, as it is wafted by the winds from one shore to another. The *byssus flos-aquæ*, water flower, floats on the sea all day, and sinks a little during the night, as if to protect itself from the injuries of nocturnal air; or possibly this may be it's mode of sleeping or taking rest.

The changes of appearance in *conférva polymórpha* are most extraordinary, and have given rise to some beautiful lines in the Botanic garden. This plant twice changes it's colour from red to brown, and then to black, and varies

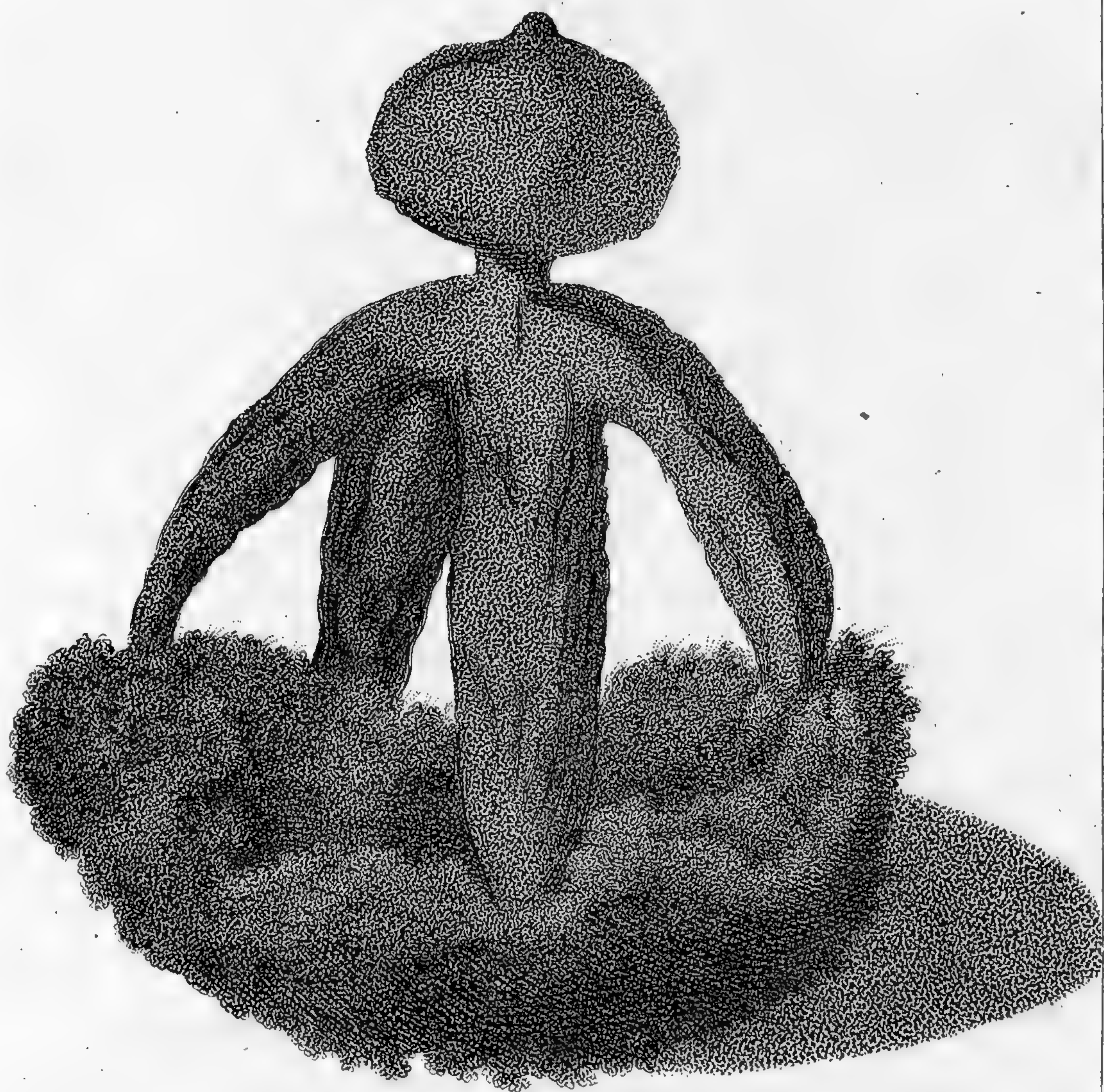
ries it's form, by losing it's lower leaves, and lengthening some of it's upper ones, so as to be mistaken by unskilful botanists for different plants: it grows on the shores of this country. The last order of the class Cryptogamia consists of the Funguses, or Fungi. Linneus has divided this order of plants according to the method of Dillenius; indeed he does not seem himself to have attended to any of the orders of this obscure class, with that indefatigable research, which characterizes his labours in regard to the other part of the vegetable kingdom; but, with a candour belonging to true knowledge, he frankly owns himself indebted to Dillenius, and Micheli, for the information he is able to give the world respecting them. The method of Dillenius, which Linneus has followed, is founded upon the figure of the Stipe, or Foot-stalk; the hat, or upper part, with it's plates, holes, and cavities; and from the variety of structure in these parts, has divided the whole Fungus tribe into ten Généra. The sudden appearance of these kinds of plants, in places where they had not been known before, gave rise to the belief, that they had their origin from putrefaction; but this has been clearly proved to be a mistake, and that they are produced from

from seeds; that their species are constant, and renewed by uniform laws; notwithstanding it must be confessed, that we are yet much in the dark concerning this part of the vegetable creation; but, as it is now particularly attended to, a few years may probably make us acquainted with the various modes of it's reproduction. We already owe much to the accurate investigations of Mr. Curtis, and to other able botanists of the present age, who have elucidated the knowledge of these plants by many beautiful drawings. In the class Cryptogamia advantage may be particularly derived from these publications, as by studying the pictures of various plants belonging to that class, an interest in the originals will be acquired, and the student be led to search into their histories, in which, no doubt, there is much curious matter to be acquainted with. The late discoveries of the wonderful manner by which various species of the animal kingdom are continued, may possibly lead to some equally extraordinary in the modes of vegetable reproduction. The histories of the Polypi or Hydræ astonish us, particularly of the Hydra Stentorea, which multiplies by splitting lengthways; in twenty-four hours the two divisions, which adhere to a common pedicle, re-split,

split, and form four distinct animals; these four in an equal time again split also, and thus proceed, doubling their numbers daily, till they acquire a figure somewhat resembling a nose-gay; the young afterwards separate from the parent stock, attach themselves to the roots or leaves of aquatic plants, and each individual gives rise to a new colony. The fresh-water polypus may be cut into innumerable divisions, and every separate piece will become a separate animal; a history so analogous to the tale of the hydra's heads, as to induce us no longer to believe that story fabulous; and indeed we have facts from the experiments of Mons. Trembly in regard to the fresh-water polypus, or hydra, which equal any ideas that could occur to the most romantic fabulist. And may it not be found, in some of the tribes of vegetables belonging to the class Cryptogamia, that similar modes of increase take place, exclusive of all others? for the increase of plants by strings and suckers, may be considered analogous to the reproduction of the Hydra genus. On so obscure a subject light might, perhaps, be thrown from experiments founded on analogy: it is certain that little progress has been made in the knowledge of these extraordinary vegetables
by

10

Lycoperdon Fornicatum.



*Found growing in Mr. Rooke's
Kitchen Garden, near Mansfield Woodhouse,
September 1792.*

by those who have proceeded upon the expectation of the usual mode of fructification. The uncommon beauty of an assemblage of these plants on our banks, walls, and heaths, in winter, must engage the attention of every botanist. There is a species of fungus, the *lycopérdon fornicatum*, or turret puff-ball, which is of a very extraordinary form, having the appearance of an inverted mushroom. The plate here given of this singular vegetable was taken from a peculiarly fine specimen found growing in the kitchen-garden of Mr. Rook, near Mansfield.

Adjoined to the classes is an appendix consisting of plants, which Linneus rather chose to place apart than to distribute into the several classes of his system, and this on account of their singular structure: he has arranged them all under the head of Palms, and defines them to be plants with simple stems, bearing at their summit leaves resembling those of ferns, which are termed Fronds, and are a composition of a leaf and a branch. Their flowers and fruit are produced on that particular kind of receptacle called a spadix, protruded from a common calyx in form of a sheath, termed by Linneus a spathe. The
 terms

terms spathe and spadix were originally applied to palms only, but are now used with much greater latitude, and applied to the narcissus, arum, and many other plants, the flowers of which are protruded from a sheath. In the palms the spadix is branched, in all other plants it is simple, admitting of some variety in the disposition of the flowers. The coconut-tree (*cocos nucifera*) is a palm, so is the date-tree (*phoenix dactylifera*); and it is asserted by some authors, that if the stamen-bearing flowers of this plant are gathered in a proper state of maturity, and dried, the dust of the anthers will retain its virtues for more than a year; the same also is said of the pistacia, which belongs to the class two-houses (*Dicæcia*); the corypha umbraculifera belongs to this majestic order of vegetables, being often 200 feet in height: it is a native of the West Indies, and has obtained the name of umbrella-bearing, from the shelter which its large feathered leaves afford to the inhabitants of that scorching climate from the ardent rays of the sun. This tree has also been called the cabbage-tree, but erroneously: Mr. Forster informs us, that the true cabbage palm is a species of aréca, the aréca oleracea, so called, probably,

probably, from the use that is made of the kernel-like substance, which is found towards the top, and which is a most grateful and salutary food to sailors, who have been long confined to salt diet; on which account, this substance has been celebrated by all navigators, and from them has obtained the name of cabbage, from it's resemblance in taste to that vegetable. Some writers have mentioned it as being commonly made use of for food by the inhabitants of the countries where this palm-tree is found: but this must probably be an error, as, from the best authorities, it appears that the kernel-like substance, or cabbage, is esteemed a rarity even in the West Indies, and frequently pickled and sent to England as a peculiar nicety, although the tree is a native of the soil. Nor is it difficult to account for this scarcity when we attend to the fact, that the part called cabbage cannot be obtained but by the destruction of the whole tree; nor will this appear extraordinary if we consider the mode of it's structure: the whole tribe of Palms bear their leaves on the upper part of their stems only, some of which rise to the height of 200 feet; the part eaten as cabbage seems to be the yearly shoot, by

I cutting

cutting off which the leaves, which should form the buds for the ensuing year, are destroyed, and with them the life of the plant. If the leaves from any common tree are stripped off, so as to prevent the formation of buds, the tree will be either killed, or it's vigour so far destroyed as to render it of no value.

Although the *aréca oleracea* is the only palm which bears the cabbage part in great perfection, the cocoa-nut palm, and several other kinds of palm, are said also to afford it; but the accounts of this tribe of vegetables are often so short, and given in a manner so confused, that there is hitherto little accurate knowledge obtained of their habits. The history of the vegetation of the tropics, by a philosophical botanist, would be a work of the first value. There is another tree, which is known by the name of the Bread-fruit tree, which is an inhabitant of the islands of the South-Sea, and also of asiatic growth; of much more extensive utility than the cabbage-palm. This is the *artocárpus commúnis* of Forster, and belongs to the class *Monœcia*, one-house. The various attempts which have been made to introduce this valuable tree into
the

the West India islands promise at length to be successful. There are now plantations of it in Jamaica, from which fruit has been gathered. Nearly twenty years ago Dr. Thunberg exerted his best endeavours to bring it into Europe; but at the time, when he flattered himself that he was on the eve of depositing his treasure with safety, all his hopes were frustrated by a violent storm, which endangered the loss of the vessel on board which he was conveying his valuable cargo of more than a hundred bread-fruit trees, and other rare plants, all of which were destroyed. These trees he had brought from the island of Ceylon, the inhabitants of which make use of the fruit in a variety of luxurious dishes. Dr. Thunberg enumerates fifteen different ways in which they have it prepared; but that which gives this celebrated tree its real importance is the extensive benefit which is derived from it to the poorer classes of the people, who make use of its fruit to supply the place of bread or rice, or as our poor do of potatoes, whence its name of bread-fruit. The natives of Otaheite, of all degrees, make use of it also in the most simple manner; they bake it amongst hot stones for food, and mix it with water for

their liquor. There are two kinds found in Ceylon; one which yields smaller fruit, has no seeds, and is more rare; the other, bearing fruit from thirty to forty pounds weight, grows in all parts of the island, and produces seeds to the number of two or three hundred, each of which is four times the size of an almond. Mr. Forster tells us, that the bread-fruit tree of the South-Sea isles has four or five varieties, all without seed; which deficiency he attributes to the effects of cultivation; but as Dr. Thunberg, contrary to his usual accuracy, omits giving the botanical names of the bread-fruit tree of Ceylon, it cannot be ascertained in what particulars it differs from, or agrees with, those of the Pacific Ocean; but there can be little doubt that they are of the same genus. If they are deprived of their seeds by cultivation, they lose a part which in Ceylon is much esteemed as a nutritious and palatable diet, these seeds being prepared for the tables of the rich in different ways. Fried in cocoa-nut oil they are esteemed a great delicacy; by the poor they are eaten roasted like chestnuts, alone, or mixed with the pulpy part of the fruit, which they also frequently eat simply boiled

or

or roasted, or sometimes mixed with a little rice, raspings of cocoa-nut, onion, and a small quantity of salt and turmeric. The bread-fruit trees flourish for whole centuries, and bear their fruit, which ripens by degrees, not only upon the thickest branches, but upon the stem itself, for the space of eight months together. The fruit is used for food in three different states of ripeness, but cannot be eaten without preparation, till it arrives at maturity; at which time the pulp, which surrounds the seeds, has a sweetish taste, and is often eaten in it's fresh state, after peeling off the rind, which is thick, and covered with prickles.

The banana and plantain tree (*musa sapientum*, and *paradisiaca*) natives of the West-Indies, have obtained the name of bread-trees from the same cause that the *artocarpus* has been so called; many hundred acres of them being cultivated in Jamaica for the use of the negroes, who are said to prefer the fruit of the plantain tree, when roasted, to bread, and that most of the native whites use it in the same manner. The banana is also found in the South-Sea isles, and is said by Mr. Forster to lose it's seeds by cultivation, as the *artocarpus* does;

but it is not food only that these trees supply to the inhabitants of the warm climates: the banana administers to their wants by the shade of it's leaves, the size of which is often eight feet long, and three feet broad. It is most interesting to read the accounts given of the vegetables in those luxuriant regions, which these trees, among others of equal or more extensive use, inhabit. The cocoa-nut tree seems to merit a place in the first rank; and Dr. Thunberg tells us of two species of palm-tree in Ceylon, the *borassus flabelliformis*, and *licuala spinosa*, the leaves of which are used without any further preparation than separating and cutting them even, for writing upon; the method of performing which is to carve with a fine pointed style the letters upon the leaf, and then rub them over with a fine charcoal, which gives them the appearance of having been engraved: thus they write all public edicts and letters, and form books by stringing several slips of these leaves together, and ornament them by figures engraved in the same manner as the letters: one of these books Dr. Thunberg brought with him to Europe. The leaves of the *licuala* palm are also used for umbrellas; one single leaf is said to be sufficient

to shelter six persons from the sun or rain; a luxuriance of vegetation of which europeans can form but very inadequate ideas.

Linneus has annexed to his *Génera Plantarum* an attempt to arrange all known vegetables according to their natural affinities; which, from the principle of his artificial method, are necessarily separated, and distributed amongst the various classes in his system. To establish a natural method, or one founded on the numerous, permanent, and sensible relations, that one plant bears to another, has been attempted by many eminent botanists, and with much success in regard to many of the *généra*; but, unless the species could also be arranged in the same manner, a system cannot be established upon these principles. The superior excellence of an artificial system seems now to be generally allowed, as more readily leading us to the knowledge of a plant, that we may wish to be acquainted with, so far as it's class and order. However, Linneus was of opinion, that time would discover a natural system; and that all plants, of what order so ever, would be found to show an affinity to some others, to which they are nearly allied; and on this principle

he has arranged his natural orders, of which there are fifty-eight, and rather more than a hundred généra, which he calls yet dubious. These orders are well explained in Mr. Milne's Botanical Dictionary, where we will study the characteristic marks by which the plants contained in them are assembled; but a complete knowledge should first be obtained of the artificial system, which will enable the pupil to distinguish plants, and he may then proceed to the natural orders, where he may learn the nature of them.

BOTANICAL LECTURES.

PART THE SECOND.

LECTURE I.

Génera of Plants.

HAVING acquired the knowledge of the seven parts of Fructification, of the various modes of Inflorescence, and of the Classes with their Orders, the pupil may begin with the *Génera* of plants, or third division of the system. A Genus is an assemblage of several species of plants, which resemble each other in their most essential parts, and has often been well compared to a family, the whole of which bears one common name, while a particular one, or a specific name, is given to each individual. Linneus has demonstrated, that nature has imprinted certain characteristic marks on

the parts of fructification, which may be esteemed the alphabet of botany, and by the study of which alphabet we may learn to read the généra. He enumerates 26 marks or letters; the first six are taken from the calyx. 1st, the Involucre; 2d, the Spathe; 3d, the Perianth; 4th, the Ament; 5th, the Glume; 6th, the Calypstre; three from the corol, the Tube and Claws, forming the 7th character; the Border the 8th; and the Nectary the 9th. The stamens afford two marks, 10th, the Filaments, 11th, the Anthers. The pistil three; 12th, the Germe; 13th, the Style; 14th, the Stigma. From the Pericarp are derived seven; 15th, the Capsule; 16th, the Silique; 17th, the Legume; 18th, the Nut; 19th, the Drupe; 20th, the Berry; 21st, the Pome. From the seed are taken two; the Seed itself the 22d mark; and the Crown the 23d. The Receptacle of the Fructification makes the 24th; the Receptacle of the Flower the 25th; and that of the fruit the 26th, which completes the alphabet. These two kinds of receptacles may require some explanation. The receptacle is that of *the fructification*, when it contains the corol, the stamens, the pistils, and the germe, which belong to one flower.

When

When it is a base, to which the parts of the flower are joined, and not the germe, it is a Receptacle *of the flower*, which may be seen in dog-tooth violet (*dens canis*), primrose (*prímula*), and in various other flowers: in which case the germe, being placed below the receptacle of the flower, has a proper base of it's own, which is called the Receptacle of the Fruit: of this the tree-primrose (*cenóthera*) is an example. Linneus does not mention the Receptacle in his *Génera Plantarum*, except when he can introduce it as a character varying in shape and surface; by which several of the *généra* of the class *Syngénésia*, United Anthers, are distinctly marked. With the alphabet, or 26 marks taken from the fructification, added to the number, figure, situation, and proportion, Linneus has so well distinguished the *généra* from each other, that nothing more is wanting to enable us to read the whole vegetable kingdom. When an essential character could be obtained he has added it, as that taken from the nectaries in *parnássia*, *héllebore*, *ranúnculus*, and *âconite*. Could so distinguished a mark be found in all *généra*, it would render the study of botany agreeable indeed; and we
are

are not to despair of time bringing about this much wished for improvement; and it more probably will be obtained, if we content ourselves with making the principal point of our labours the perfecting the system of our great master, than if we endeavour after fame by seeking to establish a new one. In the first attempts of the botanical pupil to refer his flowers to their proper *généra*, some difficulties may occur, and he may find the language of the translated system of vegetables uncouth to his ear; a very short time, however, will render it familiar, and he will then perceive the superior excellence of its expressive conciseness over every other work which has yet been published for the use of the english botanist. The *canna indica*, a plant to be found in all hot-houses, and the *hippúris*, mare's tail, with which our ditches abound, are proper specimens for examination. These flowers, containing each one stamen and one pistil, must be looked for in the first class and order *Monándria Monogy'nia*. On opening the book at this class, the pupil will find the names of thirteen different plants; these plants are separated into two divisions; in the first division there are ten plants, the character

character of which is “ fruit celled, *beneath*.”

The terms *beneath* or *above*, applied to the germe, expresses it's situation in regard to the receptacle. In the rose it is below, also in apples; and the same situation of the seed-vessel being made use of as a mark by which the subdivision of an order is distinguished, the necessity is evident of becoming acquainted with these very minute peculiarities. Under the second division, characterized by “ fruit celled, one-seeded,” there are three genera; at the same time the names of two other plants occur, printed in italics, *valeriana rubra*, and *calcitrapa*, which may require some explanation: these are two species of *valeriana*, which have but one stamen. When Linneus has thought proper to make the circumstance of an individual plant differing in the number of stamens from the rest of it's genus, the mark of the species, he has always noted such plants under the classes to which, in strict propriety, according to the rule of his system, they should have been referred, and marked them with an asterisk; so the *lychnis dioica* will be found noted in the class two-houses; and several others in the same manner.

The

The character “fruit celled, beneath,” places the canna in the first division of plants of the first order. From the first fix it differs so materially in appearance that there can be no doubt in rejecting them; but to the seventh, koempféria, there is some similarity; the corols of both are “fix-parted, lips two-parted.” The revolute form of the corol distinctly marks the canna. The genus being discovered, the number by which it is marked must be observed. Canna is distinguished by No. 1; by turning over the page that number will be found, and under it a more diffuse description of the character of the genus. The hippúris there can be no difficulty in discovering; it’s single seed ranks it plainly under the second subdivision of the first order, to which it’s one pistil had referred it: it will be found destitute of calyx and corol, marks which distinguish it from the two other genera with which it is arranged. The No. 11 refers it to a fuller description, which so well agrees with it’s habits, that it’s genus cannot be doubted of. Thus through all the classes the same method of arrangement will be found; a method which greatly facilitates the study of the plants contained in them, and particularly

particularly of those classes wherein very many genera are comprised. The different species are also arranged in the same manner, when any peculiar character occurs in a certain number of them, as in *lonicéra*. When the young student has gathered a honeysuckle, he must first examine it's classcal character: he will find five stamens, with one pistil; which parts of fructification will refer the plant to the class and order *Pentándria Monogynia*. He must then examine the subdivisions of that order, and will find that his flower must belong to that which is characterized by "flower one-petalled, *above*;" the term *above* expressing that the germe is beneath the other parts of fructification. Under this division he will meet with between thirty and forty genera; but perceiving that the seed-vessel is a berry, he will find his search limited to not more than twelve. The number of seeds within the berry, or the number of cells which it contains, are not obvious characters to an unexperienced eye; the form of the corol, however, is evident to the most superficial observer; and there are only two genera in which they are marked as unequal; these are the *lonicéra* and the *triósteum*, and
between

between these two there is so clear a distinction in the form of their stigmas as cannot be mistaken, that of the *lonicéra* being headed, and that of the *triósteum* oblong. The more diffuse account of the genus must still be investigated. The number of *lonicéra* is 233, which refers to the same in the fuller description of the genus: this description agrees with the character of the honeysuckle. Again: under the generic characters there are three divisions; these divisions are of the species, which reduce under one head as many of the *généra* as agree in any one circumstance; from which the specific character is formed. If the specimen examined have a twining stem it must then be referred to the first division; if the peduncles are two-flowered, to the second; if many-flowered, to the third. But the *généra* must be well understood before any attempt is made to investigate the species; and when they are entered upon, many observations may be found in the *Généra Plantárum*, noted beneath the generic characters, which may be very useful in elucidating the specific distinctions. There is another work of Linneus's, the *Species Plantárum*, which gives an account of the species only,

only, with their varieties. This work is not translated, which is much to be lamented, though the System of Vegetables in part supplies it's place, and is much to be preferred to it, being an abstract both of the Species and Génera Plantárum. The System of Vegetables is a work of wonderful ingenuity; there are to be found in many single pages of it twenty plants accurately discriminated from every other known plant; and more than 10,000 plants are described in the compass of one octavo volume. The translation of this work cannot be too highly prized by all who are unacquainted with the Latin language, and are desirous of studying botany. The iris is a flower liable to perplex the young botanist; but in observing the same order of investigation as that recommended in the canna and lonicéra he will readily be able to refer it to it's genus. The character, "petal-like," of the stigma, distinguishes the iris from several other génera of the class Triándria and order Monogy'nia, with which it is arranged, although, before the flower is dissected, the trifid divisions of it's summit might be mistaken for petals. The whole form of the flower is beautiful; the corol is six-parted,

the

the three outer divisions falling back, the three inner erect, and all joined together by their claws, the stigma “petal-like.” By stripping off the six-parted corol the stigma may be plainly seen. Under each of its three divisions is a stamen pressed down upon the falling petals of the corol. Some species have a beautiful fringe along the middle of these reflected petals, which is the nectary; others have another kind of nectary, consisting of three honey-bearing dots, externally, at the base of the flower. The capsule also varies in different species; in some it is three-cornered, in others six-cornered. These are observations on the family of the iris which are very useful. Such *généra* as are nearly allied to each other are placed in regular order; and if their affinity is great, the circumstance which separates them into distinct families is noted.

The circumstances of colour, smell, or taste, however essential to the use or agreeableness of the flower, are liable to vary so much, that they are by no means proper to enter into either the *généric* or specific characters of plants, which ought always to be taken from such marks as are most constant.

On

On this account Linneus has rejected the dimensions of the parts, except relatively, one to the other; place of growth also is too uncertain to be admitted as a decided character: but all these circumstances of smell, taste, colour, size, and situation, are noted after the specific characters in the *Species Plantarum*, and have their use, if taken in aid of the more decided marks of discrimination. Linneus esteemed the nectaries of greater importance in determining the *généra*, than almost any other part; and, by the use he has made of them, has established their consequence, although so much neglected and overlooked before his time that they had not even a name. In the class *Monadélphia*, one-brotherhood, the orders depend on the number of stamens; and the *généra* contained in those divisions are again separated by their number of pistils. But although this is the leading character, it is by no means sufficient to distinguish the families from each other. The manner of growth of the seeds, or the vessel by which they are contained, with the number of divisions of the calyx, are frequently had recourse to in the discriminations of the *généra*. From the numerous kinds of geraniums, and the

K

variety

variety observed in their number of stamens, Linneus found it necessary to arrange them under different heads, as may be seen in the System of Vegetables. These divisions being chiefly regulated by the variation in the number of stamens, could not but perplex the young botanist, from being in direct contradiction to the character of the order under which they were primarily assembled. L'Heritier's new arrangement of the geranium tribe has removed these difficulties, and added great improvement to the Monadelphica class. He has divided the family into three distinct genera, *Erodium*, *Pelargonium*, and *Geranium*; the names *Erodium* and *Pelargonium* signifying heron's bill and stork's bill, as *Geranium* signifies crane's bill. *Erodium* includes Linneus's division with five perfect anther-bearing stamens; *Pelargonium* those with seven anther-bearing stamens; and *Geranium* those with ten. It is doubted whether the genus *Geranium* may, with strict propriety, be classed with the flowers of one-brotherhood, as it has not its stamens decidedly united at their base; at present it remains in the class to which Linneus referred it, and probably will be continued there, as the appearance

pearance of the stamens and pistils so much resemble those of all the one-brotherhood flowers, that, without very nice examination, the want of union at the base is not easily discovered. Four of our British species of *geranium* ought now to be arranged under the genus *Eródium*, only five of their anthers bearing stamens; these are the *cicufanium*, the *pimpinellifólium*, the *moschátum*, and the *maritimum*.

Dr. Smith, in his agreeable and useful publication of english botany, has thrown much light upon the genus *Geranium*. He has shown us that the aril of the seeds varies so much in the different species that a better mark of distinction cannot be had recourse to. His elegant and truly scientific work should be in the hands of all young botanists who are desirous of becoming acquainted with the plants of their own country. In the class *Syngenéſia*, united anthers, the form of the corol of the separate florets, or the manner in which they are placed on their common receptacle, are the marks by which the different orders are divided. By tracing some of the larger flowers to their génera the method of studying this intricate class will be

best understood. When the pupil has provided himself with an artichoke (*cy'nara scolymus*), he will find the florets of which it consists all of them to contain both stamens and pistils: this circumstance refers it to the first order. The first division of that order comprises that species of corol termed, by Linneus, ligulate, or tongued. The artichoke cannot have a place among the flowers assembled under this character, the corols all being tubular. The next division is marked by the flowers being *headed*, the mode of inflorescence which is found in the plant under examination. In this division are arranged ten genera. The different characters of the first five by no means agree with the artichoke; but the obvious marks of the "calyx ragged, with scales channelled, thorny," refers it immediately to the genus *Cy'nara*; and on examining the more diffuse description at No. 928, there can no longer remain a doubt that it is of that family: the beautiful pappus which crowns the seeds, and the size of the receptacle, which is the part we eat, are objects well worthy of observation. In dandelion the florets are all furnished with stamens and pistils, and of the ligulate form. In the
numerous

numerous génera comprised under this head, the receptacle is the first mark of distinction; that part of fructification in the dandelion is naked, or clear from either down or chaff; the calyx is imbricated with loose scales; a circumstance found in this genus only: the plant, therefore, is leóntodon. There is, however, another character which ought to be attended to; this is the pappus. The distinction betwixt plumed and hairy may require some explanation. The pappus of seeds in the compound flowers is either formed of simple hairs, or of hairs set with other finer hairs. In the former case the pappus is called hairy; in the latter plumy, or feathery: the pappus of artichoke (cy'nara) is hairy. In the leóntodon the pappus, "plumy stiped," or fixed upon a short foot-stalk, is an essential character of the genus; though, not being the only one, is not of so much consequence. In dandelion (leóntodon taráxacum) this mark is not found; and in the observations beneath the generic characters, in the Génera Plantarum, this deficiency is remedied, and also some peculiarities in a few other species, which might have separated them from their genus with as much propriety as the taráxacum

has been removed. *Tragopógon*, goat's-beard, exhibits a specimen of the plummy pappus; in the artichoke this part is distinctly hairy. This minute circumstance respecting the pappus of seeds is of great use in marking the génera, therefore should be attended to: if it is exposed a little to the air to dry it will then be more clearly perceived of which kind the pappus may be esteemed. The deficiency of the plummy pappus in dandelion has been thought sufficient, by Scopoli, to make another genus of it, which he has named *Hedypnois*. However, as Linneus has uniformly shown his disapprobation of multiplying the génera from the single circumstance of an individual differing in any one part of fructification from it's family, it would, perhaps, be better to follow his method in this respect. There may be frequently found, in the compound flowers, distinctions obviously marked. In the burdock (*arctium lappa*) the outer scales of the calyx are hooked at the extremity with very sharp shining hooks. The *onopórion*, cotton thistle, is distinguished from the *cárduus*, the true thistle, by having a receptacle somewhat like a honeycomb, that of *cárduus* being hairy; and hence may be perceived

ceived the excellence of the Linnean method. Mr. Curtis has, in many génera of this difficult class, discovered constant marks by which they may be distinguished in different states of growth. In the onopórdon acánthium, when the flowering is over, he has observed that the innermost scales of the calyx close strongly together, and preserve the seed, contrary to the calyx of cárduus, and most other génera of the compound flowers, which, as has been before remarked, expand and disperse their seeds. The smaller flowers of this class are more difficult to investigate; but, if proceeded with in the same manner as the larger kinds, a competent knowledge of them may soon be obtained. A numerous tribe of plants, termed the umbelled plants, which are contained under the class Pentándria, will be found more easy of access to the young botanist if he has some previous information in the mode of their investigation. The umbelliferous plants should be gathered for examination before their florets are wholly expanded, otherwise it will not be easy to determine the class to which they belong, as the anthers frequently drop off as soon as they arrive at maturity. If this is attended to, it

will not be difficult to trace their characters of both class and order, Pentándria Digy'nia. Under this order are comprised seven divisions. The umbelled tribe are collected under the character of their mode of inflorescence, their florets having " five petals, *above*, and two-seeded." This division is again separated into three parts, the first distinguished by the flower having an universal and partial involucre ; that is, each collection of florets being furnished with an involucre, and all together being contained by one at their base ; second, with partial involucre, and no universal one ; and the third, without involucre, either universal or partial. In the investigation of the further generic characters the pupil may be somewhat perplexed by the similarity of terms used in the distinction of umbel-bearing plants and those of the class Syngenésia. In this class, which consists of the compounded flowers, the term radiate is applied to those génera which have their florets of the circumference flat, and those of the centre tubular. In the umbellate tribe of plants the term radiate is made use of to distinguish the umbels which have the flowers of the circumference of a larger size than those of the centre ; in
of

which case it frequently happens that some of the florets are deficient in either the stamens or pistils, and thence do not all produce seeds; from which circumstance Linneus has termed them abortive, as he has called those umbels fertile, the florets of which are all productive of seeds. The term flosculous, made use of in describing the compound flowers, marks those that have all their florets tubular, applied to the umbelled plants of *Pentándria Digy'nia*. It signifies those umbels, the florets of which are all of the same size. The term uniform is made use of in the *Génera Plantárum* to mark those flowers which are called flosculous in the *System of Vegetables*. Not uniform is applied to those termed radiate. The form of the seeds is also a circumstance to be attended to in the discrimination of the species of these flowers; and both seeds and flowers may generally be found at the same time in a proper state for investigation. The *scandix pecten*, shepherd's needle, is distinguished by the very long beak with which the seeds are furnished. A specimen of the radiate flowers may be seen in this genus, the florets of the
disk

disk being often male, or containing only stamens. The disk and ray are the terms made use of to express the centre and circumference, and are frequently applied, with the same meaning, to the compound flowers. In the simple flowers of the class Pentándria there are some génera the species of which differ so much in some parts of their fructification, that it may be necessary to apprize the young botanist of this dissimilarity. The gentianella and lesser centaury, both placed by Linneus under the genus *Gentiána*, are so unlike in their appearance as even to perplex an experienced botanic eye. The structure of those species of *Gentiána*, which are known by the name of *Gentianella*, is so peculiar as to seem to give them a right to form a separate genus; and the centaury is now placed by Mr. Curtis in the genus *Chirónia*, from the circumstance of the anthers becoming twisted after they have shed their dust, a distinguishing character of the *Chirónia* genus, also from the similarity of their outward habits. Such respectable authority as that of Mr. Curtis must have great weight; and all who understand the value

value of the works of Linneus must acknowledge with gratitude the advantage they have derived from the labours and candid criticisms of that much-lamented and accurate botanist.

LECTURE II.

Nectaries of Plants.

THERE are some very common plants which, either from the natural structure of their fructification, or from some adventitious circumstance, are not easy of investigation to the young student. The house-leek (*sempervivum tectorum*), a plant of the class and order Dodecándria Dodecagynia, twelve stamens, twelve pistils, is subject to so extraordinary a change in it's parts of fructification as might nearly baffle an experienced botanist in the inquiry after it's genus. This perplexing appearance is accurately described by Mr. Curtis from Haller, who has given a very minute account of this plant. It's filaments frequently, even while young, are evidently enlarged towards their ends, and throw out from their substance little oblong white corpuscles, like the eggs of some insect: the filaments thus enlarged, are more glutinous than those in their natural state, and have
their

their anthers somewhat imperfect. As the fructification advances towards maturity, the filaments continue to enlarge about the middle, while the top is drawn out to a kind of beak, in which state they might be mistaken for the pistil. On cutting them through they appear hollow, and to contain some of the same corpuscles, which may be seen on the outside of many of them, so that it would be impossible to know them to have been originally filaments. This shows you the advantage of examining flowers in their different states of maturity, and before the full expansion of their corols. The sempervivum is nearly allied to the sedum, but differs in having more than five petals; it is also liable to increase in it's number of pistils, when it grows luxuriant.

We are obliged to Mr. Curtis for an accurate knowledge of the difficult and curious genus Euphórbia, which is the botanic name of the churn-staff. He justly remarks, that the Linnean characters of this family will not, in any of the British species, even guide us to it's class. The stamens are very minute; there are seldom more than two or three that appear above the calyx, the rest are concealed within

it, and rarely amount to twelve in number, so that it fails in the essential character of the eleventh class, wherein it is placed, that character requiring that the flowers contained in it should not have fewer than eleven stamens, or more than nineteen: the smallness of the stamens, and the milky juice, which flows so plentifully from every part when bruised, renders the investigation of the Euphórbias, on the principles of the Linnean system, extremely difficult. A clear idea of the flower and fruit of this singular genus may, however, be obtained by dissecting some flowers of the large garden spurge-tree, or euphórbia láthyris. The part which Linneus had called the corol, Mr. Curtis has now named the nectary. There is a singular appearance which crowns the seeds of these plants, and which did not escape the notice of Mr. Curtis. This extraordinary appendage is termed by him a button: it is of a fleshy substance, of a grayish colour, heart-shaped, and stands loosely on a shortish foot-stalk. In the tree-spurge it gives beauty to the large black seed which it crowns. The outer habits and milky juices of the euphórbias are sufficient marks of distinction of this genus; but

but the curious structure of their fructification well repays the trouble of the most minute investigation.

We now proceed to the Nectary, which has been defined by Linneus to be that part of the corol which contains the honey, having a wonderful variety both as to shape and situation, sometimes being united with the petals, and sometimes separated from them. The lower part, or tube, of one-petalled corols, generally is found to contain a sweet juice, which is the honey. In the flowers of *árbutus unédo* (strawberry-tree) it is so profuse as to run out, when the corol is opened, and to give the flowers a strong scent, resembling that of the honey of bees; it is also found at the base of the petals, in many of the butterfly tribe of plants. Clover (*trifólium praténse*) contains much of this liquid. The chief distinctions of the nectaries, which adhere to any of the parts of fructification, are, *first*, the spur-form, which is found in one-petalled flowers, as snapdragon (*antirrhínum*), and valerian (*valeriána*); and in many-petalled flowers, as in *órchis*, lark-spur (*delphínium*), and *viola*. *Second*, such as are on the inside of the petals,

as in crown-imperial, and all the family of fritillária, though in none so obvious as in the species imperiális, in ranúnculus, and dog tooth (erythrónium): the nectary in lily (lílium) is that raised line which runs down the petal lengthways. *Third*, the nectaries which crown the corol, as in passion-flower (passiflóra), narcíffus (ly'chnis). *Fourth*, on the calyx, as in nasturtion (tropæolum), being a spur attached to the calyx. *Fifth*, on the stamens, which in bay (laúrus nóbilis) are three glands ending in two bristles, surrounding the germe. *Sixth*, on the germe, as in some species of iris, and in hyacinth, and the plants of the class four-powers, Tetradynámia. *Seventh*, on the receptacle in sempervívum, and mercury (mercuriális). *Eighth*, all those nectaries which are not apart from the corol, but the singular construction of which does not admit of their being placed among any of the kinds I have enumerated, as in nettle (urtíca), the nectary is situated in the centre of the stamen-bearing flower, very small, in the form of a cup. In fact, the term nectary is applied by Linneus to every part of fructification, which, from it's singularity, cannot be ranked among the seven
regular

regular parts of a flower. It has been doubted whether this part exists in every flower, and certainly we find many destitute of it, as a distinct apparatus; but if any part, wherein this sweet juice, called honey, is found, has a right to be termed a nectary, it may be decided, that there is no flower without it; and that Linneus was of this opinion appears from his having named it, in the System of Vegetables, as a constant appendage of the corol, calling it the honey-bearing part proper to the flower, distinguishing it into two kinds, *proper*, when distinct from the petals and other parts, *on the petals*, when forming a part of the corol. It's not being noticed in many of the généra may seem an objection to Linneus having considered it as a constant part of the fructification; but he could not be ignorant of it's existence in the compound flowers, the lower part of the florets, of which they consist, generally containing the juice in question, and yet he has not named it in any of the généra of the class united anthers (Syngénéfia), except those of the order Monogamia, or simple flowers, which have spur-form nectaries; whence we may conclude he omitted it in all those généra, where it's

L

structure

structure was not such as to form a marked character. As a further proof of this, the nectary is not named in the one-petalled flowers, though nothing can be more evident than the honey contained in their tubes; and Linneus has, in some of his works, called the tube of a one-petalled corol a true nectary. Among the nectar-bearing stamens he enumerates those of the *fraxinella* (*dictamnus*). It seems, however, more probable, that the resinous matter, with which they abound, is not of the nature of honey, but similar to that found upon the stalks, which is so inflammable as to take fire on the approach of a lighted candle, and to burn like spirit of wine, till it is entirely exhausted.

The structure of those nectaries which are placed separate from all other parts of the fructification, is an object that merits the strictest attention, not only as distinguishing decidedly one genus from another, but from the artful manner in which they are formed for the purpose of preserving from insects the precious store contained in them. The most remarkable are those of the monk's-hood (*aconitum napellus*), of christmas rose (*heléborus niger*), parnássia, and columbine (*aquilégia*),

légia), and of the órchis tribe. In aquilégia the nectaries have been thought to resemble the neck and body of a bird, and the two petals standing upon each side to represent wings, whence it's name of columbine, as if resembling a nest of young pigeons, while their parent feeds them. In helléborus the nectaries are placed in a circle like little pitchers, and add much to the beauty of the flower; but there are not any which are a greater ornament to the flower than those of the parnáffia. The beautiful transparent globules which fringe the margins of the five scales, called nectaries, may probably contain some viscous juice, which serves to guard the honey from the depredations of insects. In the careful dissection of a pink, when the stamens first become mature, the base of the calyx will be found replete with honey. By what part of the fructification this juice is secreted, is perhaps not an easy matter to determine; but if determined, that part must undoubtedly be termed the nectary. The nectaries of the flowers of mignonette (*reséda odoráta*) are of curious and elegant construction, two fringed petals growing close together form a little casket, or box, the lid of which is a

small scale growing betwixt the stamens and petals, and pressing so closely on the latter as to shut up securely a small drop of honey in the hollow formed by their union; and bees may be frequently seen baffled in their attempts to plunder this honey, not being able to open the lid sufficiently wide to allow of the insertion of their trunks. The curious structure of the genus *Passiflora* merits minute examination. In the common passion-flower the large size of the parts of fructification renders the examination of the position of the stamens and pistils peculiarly easy. The petals and calyx nearly resemble each other in front, both being of the same form and colour; these beautiful rays are the nectaries; the stamens are five, having, at the first view, the appearance of being placed on the pistil, but in reality growing from the bottom of the germe, where it joins the little pillar on which it is elevated. The three large styles are very evident, and, from their purple colour, and that of their stigmas, give much beauty to the flower. The nectaries form the principal feature in the flowers of this genus, and in some of the species have the appearance of a basket made of
blue

blue and white beads strung upon wire. The generic characters of *passiflora*, given by Linneus, do not agree with many of the species; and it admits of some doubt whether the stamens can be properly said to grow on the germe. Perhaps the small pillar, to which both the stamens and germe adhere, might, with more propriety, be esteemed a receptacle. Linneus calls this pillar a style; but, if it be one, we are at a loss to know what part of the flower these three apparent styles, with their stigmas, must be called, and to which he also gives the name of styles. This is one of the few *généra* that we find not justly described.

It is not an easy matter to obtain a distinct idea of the parts of fructification of the *órchis* tribe: a peculiarity of structure runs through the whole of them, so different from what we commonly meet with in other plants, as to make them well worth investigating. I have given, in Plate the First of the Second Part of this Work, an engraving of a single flower of the early spotted *órchis* on it's peduncle, with it's bract or floral leaf, in which may be seen the twisted germe, the petals, the lip, and form of the nectary, of their

natural size. I have also given an engraving of the separate parts magnified: with these the natural flower should be compared. Each flower contains two stamens, the structure of which is very curious. Each of these stamens is contained within a bag or case, the edges of which fold over each other, and open in front, as the plant advances towards maturity. At this period, in many of the orchis tribe, they hang down, out of their cases, towards the stigma, and on the slightest pull they are drawn out. If gently drawn with a fine needle, they will be found elastic; and a small transparent globule may be seen at the base of each stamen, and at the top a club-shaped substance, in most of the species of a yellow colour, the surface of which is covered with small grains; these must be esteemed anthers. In a magnified view of the stamens the anthers will be found composed of irregularly square corpuscles united together by fine elastic threads. That these corpuscles produce the same effect as the anther dust of common flowers, seems highly probable, although, at present, the manner of their doing so is not known.

Many of the orchis tribe have their seed-vessels large, well formed, and filled with seeds,

feeds, which, though extremely minute, appear perfect. The smallness of the feed is certainly no argument against it's power of vegetating. Some of the ferns, the feeds of which are much smaller, are well known to be propagated from feed, and to come up spontaneously in hot-houses, where the original plant has scattered it's feed; and probably by minute attention the seedlings of órchis may be discovered. However, I am of opinion, that the órchises are propagated from feed, as many young plants of them are frequently found together, and it is well known that they never increase plentifully by the root; but in this, and all other parts of natural history, we can only hope for satisfaction from accurate and repeated observation. The art of making experiments is, however, possessed by few, and requires much patience, added to an accurate and impartial judgment. If we watch a bed of órchises, in the hope of finding seedlings on it, we shall eagerly catch at every circumstance that can favour this hope. It is the business of an experiment maker to be always looking for circumstances which make against his theory, and not for it; and to state as strongly what he remarks

unfavourable, as favourable to his wishes. The early spotted orchis is easily distinguished from every other known species; its spotted leaves and large bright purple flowers will generally be marks sufficient; but should the young botanist please himself with the supposition of having gathered a variety of kinds of orchis morio, he would be much disappointed to find, on examination, that they belonged to one species only; an instance which shows how little to be relied on are the colours of the corol, which in this species assumes all changes of colour, from a deep purple to a white. Yet, under all its varieties, this flower is distinguished from all other british orchises by retaining more or less strongly the character of having its two outermost petals marked with green parallel lines. In this orchis the anthers are of a green colour.

There are ten distinct british species of the real orchis; but by common observers some other genera have been confounded with them, which ought not to have been so. Linneus has distinguished the different genera of these curious plants by the form of their nectaries. The flower commonly known by the name of bee orchis belongs to the genus of ophrys, and

is the species *apifera*, bee-bearing. The distinguishing character of *óphrys* is the nectary hanging down longer than the petals, and being slightly keeled behind only. That species, commonly called the tway-blade, is the egged *óphrys*. By comparing these flowers with the plates of Mr. Curtis's London Flora * they will be found most accurately given; and the great difference in the structure of the *órchis* and *óphrys* genera will be well seen. These genera are also greatly elucidated by the observations of Dr. Smith in his English Botany. Linneus has formed the specific characters of several of these flowers from peculiar circumstances found in the nectary; that of the tway-blade, or *óphrys ováta*, is marked by it's nectary being two-cleft. The leaves of these two species of *óphrys* differ materially from those of the *órchis* tribe. The root of the *óphrys apífera* resembles those of the *órchis* genus, which are bulbous, but that of the *ováta* is fibrous. Linneus, in the generic characters of the four families of *órchis*, *saty'rium*, *óphrys*, and *serápias*, which are all

* For the convenience of those, who may not have access to that valuable publication, a plate of the *órchis* and *óphrys* is given at the end of this Lecture.

closely

closely allied, marks the circumstance of the germe being twisted as a peculiarity common to them all. It certainly does not run through all the species, and might probably be found exclusively to belong to the *órchis* genus.

EXPLANATION OF PLATE I. PART II.

PARTS OF FRUCTIFICATION OF HIPPURIS, CANNA, EUPHORBIA, ORCHIS AND ARUM, AND THE NECTARIES OF PARNASSIA AND ACONITUM NAPELLUS.

- Fig. 1. Part of a Spike of Hippúris Vulgáris, with the flowers in the bosom of the leaves, *a*.
- Fig. 2. A Flower of Hippúris Vulgáris magnified.
- Fig. 3. Anther-bearing Petal of Cánna, *b*. With the Style growing to the Petal-form Filament, *c*. *d*, The Stigma.
- Fig. 4. Three-leaved Perianth of Cánna growing upon the Germe.
- Fig. 5. A Flower of Euphórbia Helióscopia magnified. *e*, The Calyx. *f*, The Nectary. *g*, The Stamens. *h*, The Germe. *i*, The Stigma.
- Fig. 6. Seeds of Euphórbia to show the small white button at the upper end, *k*.
- Fig. 7. Nectaries of Parnássia and Aconítum Napéllus, Monk's-hood.
- Fig. 8. Stamens and Stigma of Passion Flower.
- Fig. 9. An entire Flower of early spotted Orchis. *l*, The Bract. *m* and *n*, The Petals. *o* and *p*, The lip and horn of the Nectary. *q*, The twisted Germe.
- Fig. 10. The Stamens magnified. *r*, The Glands at their base.
- Fig. 11. A Stamen magnified with the Anther drawn out.
- Fig. 12. A Flower of Ophrys Ováta. *s*, The Cloven Nectary.
- Fig. 13. A Flower of Ophrys Apífera, Bee-ophrys. *t*, The Petals. *u*, The Nectary.
- Fig. 14. A Flower of common Arum. *v*, The Anthers. *w*, The Germe. *x*, The Nectaries above and below the Anthers.

Fig. 1.

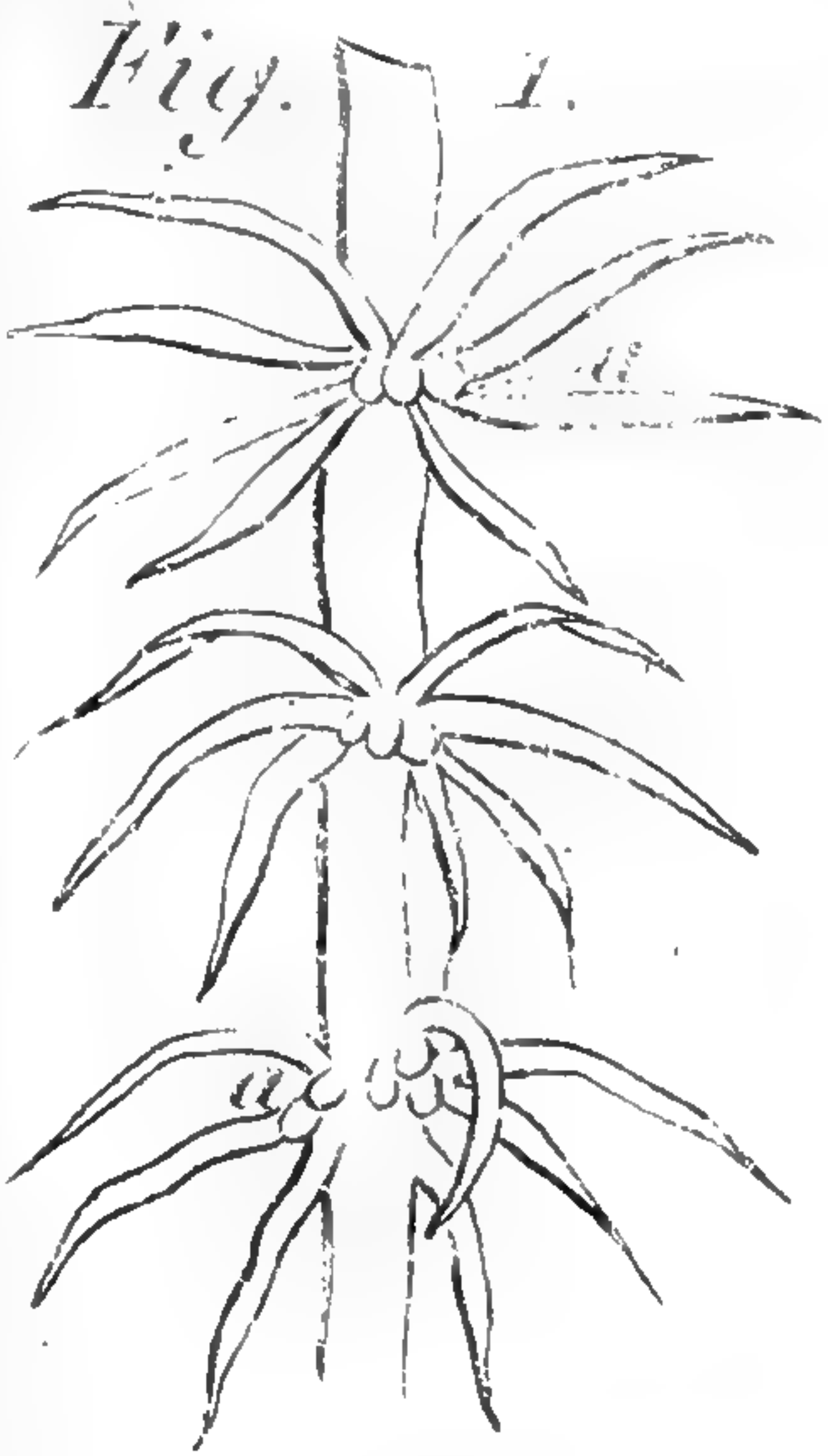


Fig. 2.



Fig. 4.



Fig. 3.

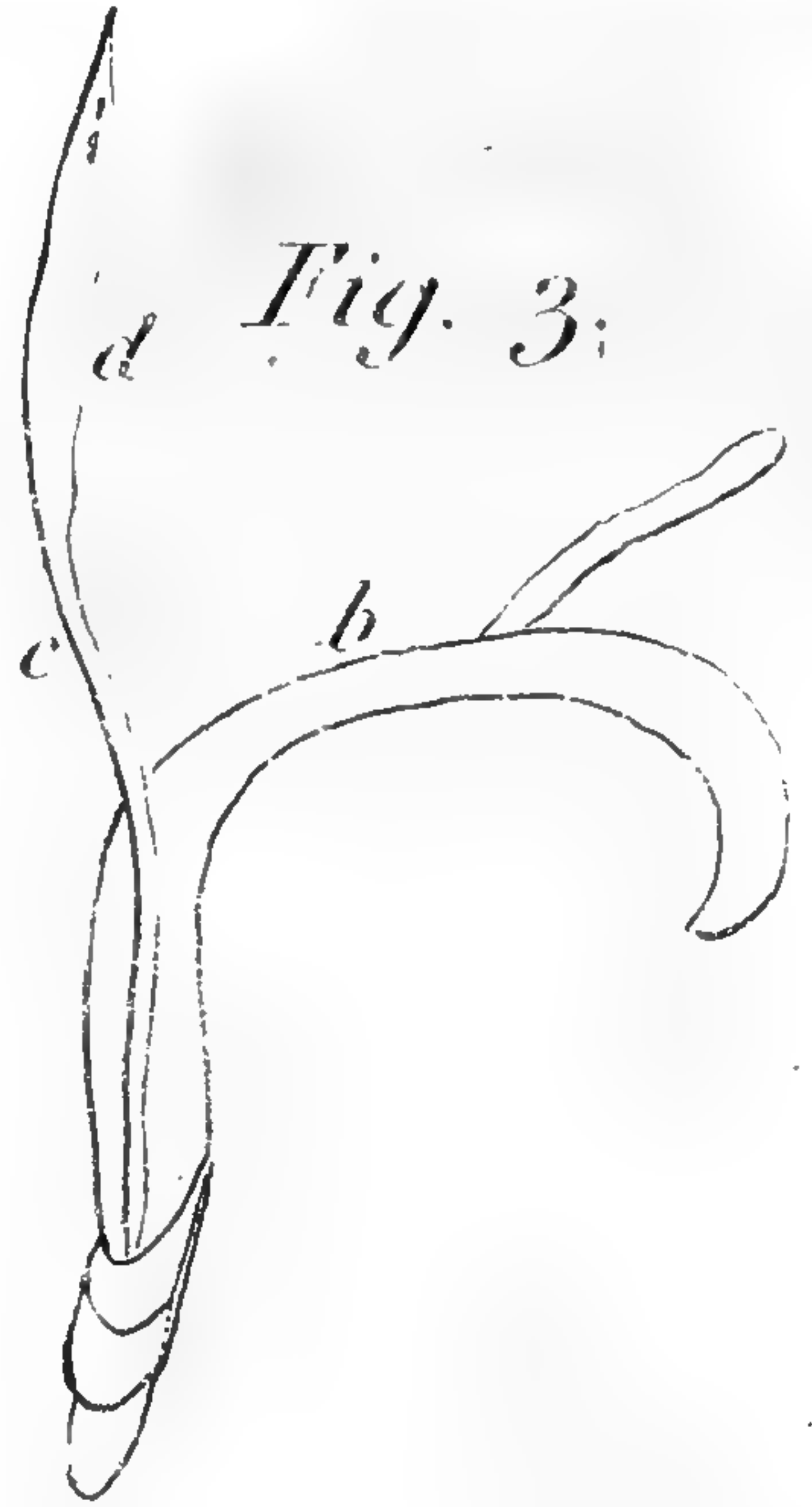


Fig. 6.

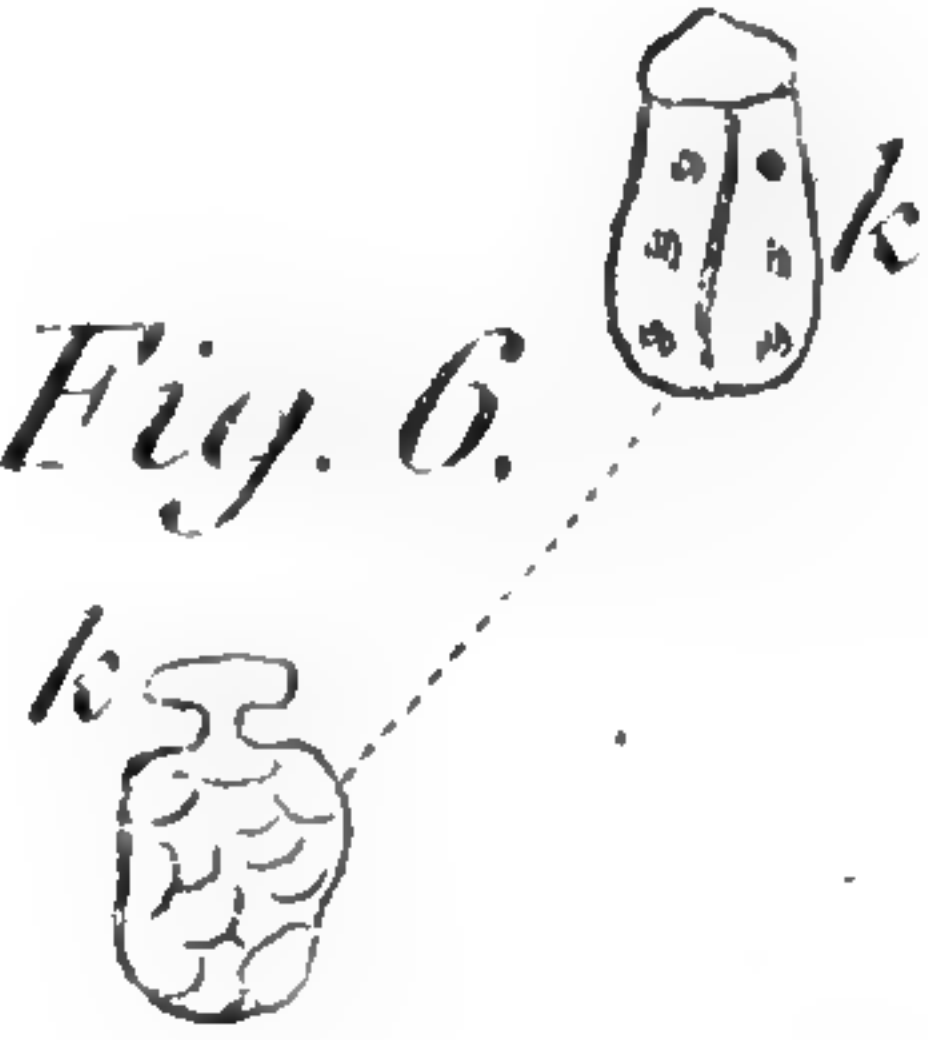


Fig. 5.

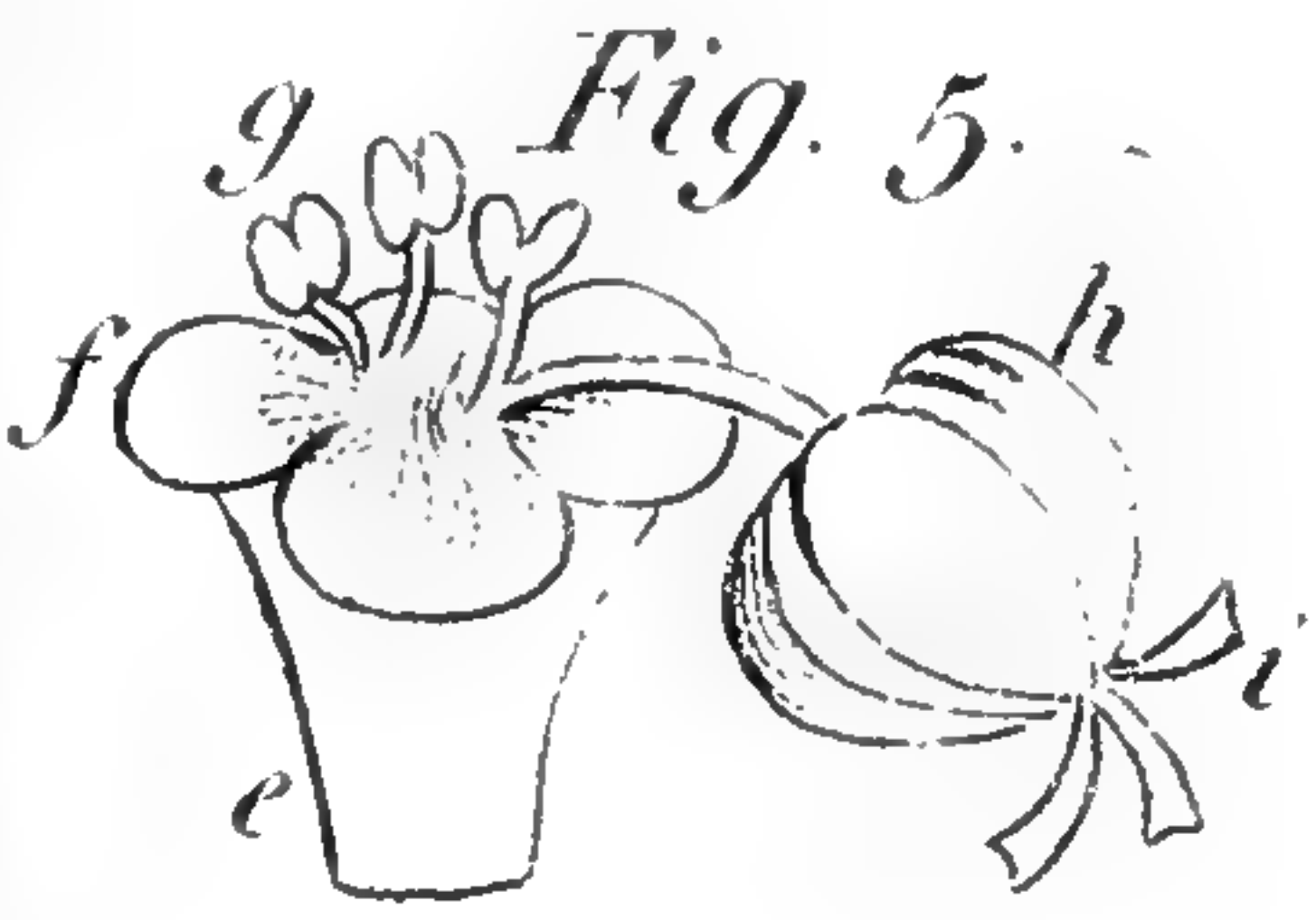


Fig. 8.

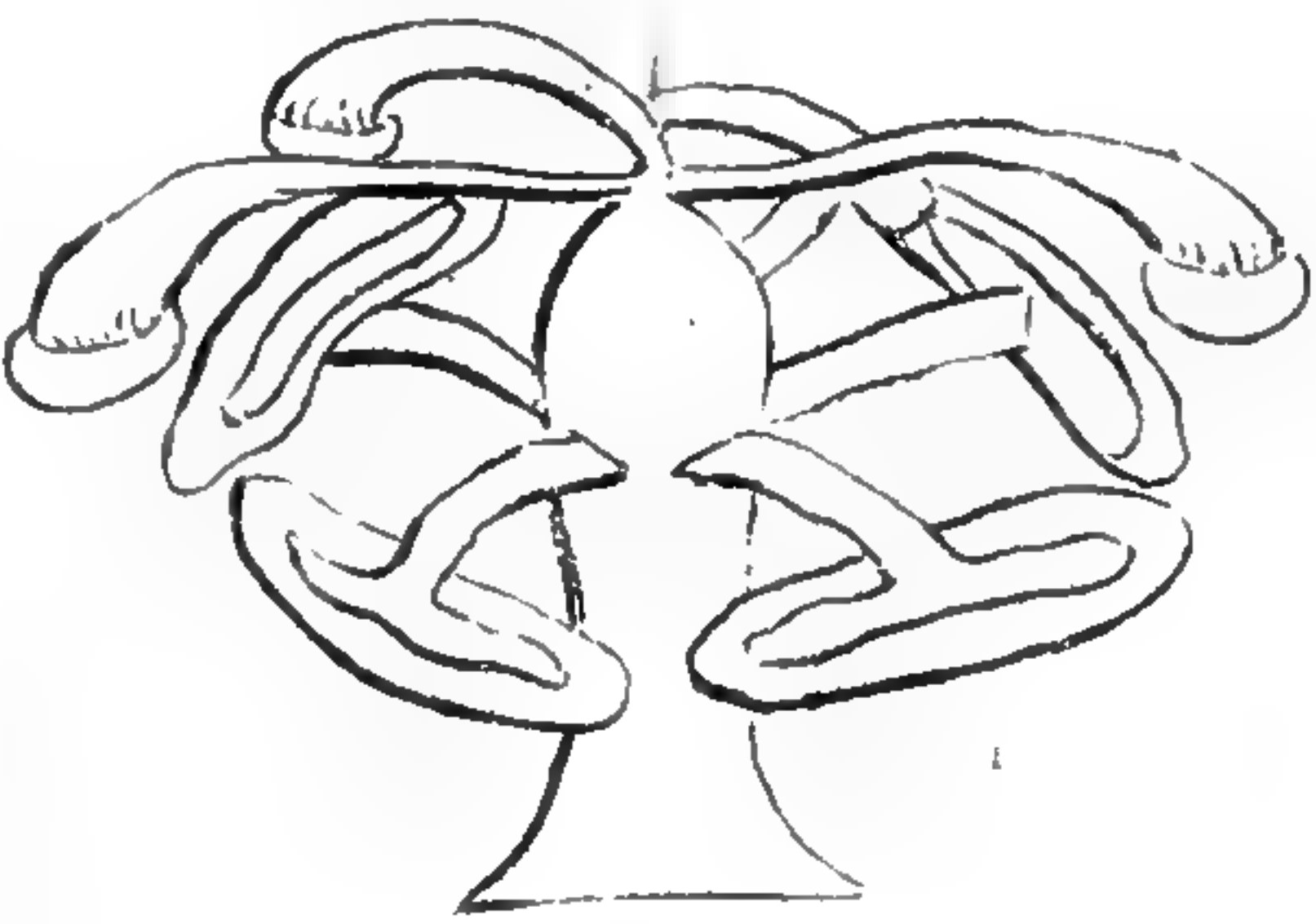


Fig. 9.



Fig. 7.



Fig. 13.

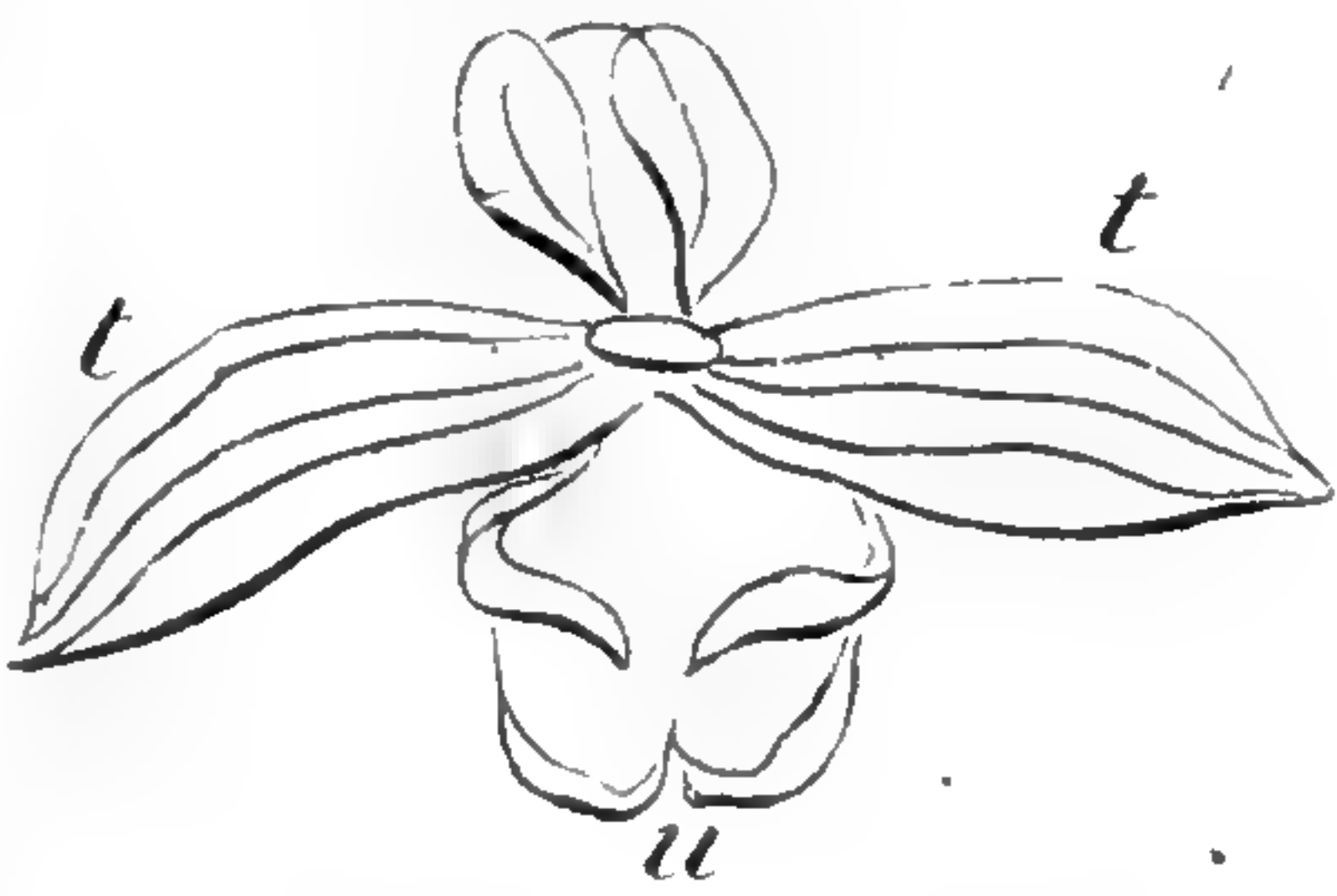


Fig. 12.



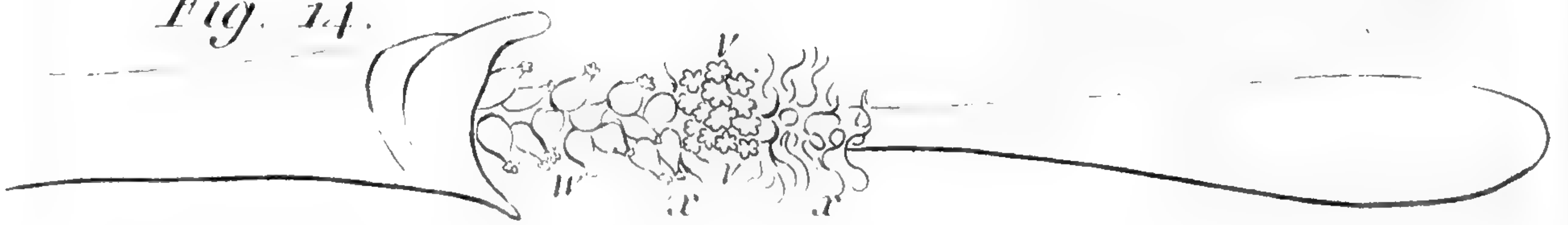
Fig. 11.



Fig. 10.



Fig. 14.



LECTURE III.

*Investigation of different Généra of the Classes One-house
and Two-houses. Of Ferns.*

HOWEVER extraordinary the structure of the généra just now considered may appear, there is yet another genus of the class Gynándria which, in the curious mode of it's fructification, surpasses them all; this is the árum, of which the british plant known by the common name of wake-robin, is a species. This plant is subject to great variety in it's colours. The part called by children the tongue varies from a yellowish green to a deep purple; the leaves and heads differ in sometimes being beautifully spotted with black, at others plain green; the leaves also are found of different shapes. This is a wonderful flower, and seems intended by nature to show us, that she is not confined to any one method of renewing her productions. Here are berries produced with perfect seeds, which
germinate

germinate and continue the species, as certainly as those seeds formed in plants, which we call of a more natural structure,* because they are of one more common. All other known plants have their pistils placed within the stamens. In the árum the stamens are situated rather more inward than the pistils, and above them on the receptacle. These stamens are not raised by filaments, but are a collection of anthers four-cornered, and growing to the club-form receptacle; above and below these anthers are placed several roundish bodies, terminated by a tapering thread; these Linneus calls the nectaries. Beneath the lower order of nectaries, the seed-buds are placed, surrounding the base of the spadix, or tongue, of an oval shape, without styles, and their stigmas bearded with soft hairs. These seed buds become berries of a beautiful bright scarlet colour, corresponding in number with the germes; are round, and have one cavity. The younger Linneus was of opinion, that the árum did not properly belong to the class Gynándria, but that it should be placed in the class One-house, as every anther and stigma were rather to be esteemed distinct florets, than as belonging to one common flower;

flower; at present it remains in the class *Gynándria*. The root of this árum is extremely acrid; but that property does not prevent it's being dug up and eaten by the thrushes. Some species have their roots so mild as to make a part of the food of the inhabitants of the hot countries, where they grow; and some of the sorts are cultivated by the inhabitants of the South-Sea isles, and of the sugar colonies, as esculent plants. The leaves of one of the species, called indian cale, are boiled to supply the want of other greens. The roots of the árum maculatum, which is the British species, were formerly used for starch; Gerrard mentions it having been so, and adds, that it was so extremely acrid, that the people who made use of it had their hands so much chapped, that they were healed with difficulty. This property is not alone confined to the root, the whole plant abounds with an acrid juice.

Much curiosity and beauty of structure are to be found in the flowers of a genus of the class *Dioëcia*, *hydrócharis*, or frog's-bit. This plant is of aquatic growth, and one of the most ornamental of our water plants. The leaves, the whole structure and economy of
this

this plant, are exceedingly curious, and merit minute examination. The male flowers of the *hydrócharis* have nine stamens, disposed in three rows. The filaments of the middlemost row put out from their base, on the inside, a style-like substance, which is placed in the centre of the flower. The two other rows are connected at the bottom, so that the internal and external filaments adhere together. The anthers are yellow, nearly linear, and have two cavities. Linneus does not take notice of the nectary, but Mr. Curtis has observed, in the female flower, three yellow glands crowning the germe, to which he gives that name. The spathes of the flowers give the plant somewhat the appearance of sea-wrack (*fucus*). These buds, from their transparency, have the appearance of bubbles, and are very numerous, both in the male and female plants, and chiefly grow near the root. In the male there are also a pair of these spathes, which grow out about the middle of the flower-stalk, and look like little bladders, containing the tender unopened flowers. Mr. Curtis differs from Linneus in describing the female flowers as enclosed by a spathe, which contains only one flower, that of the male

male three or four. Among the aquatic plants we find not only beauty but magnificence; the greater and lesser typha, with their yellow downy spikes, attract the eye of the botanist from a considerable distance, but are not satisfactory to a novice in the science. Their flowers, consisting of very minute parts, are difficult of investigation; Mr. Curtis's account of them somewhat differs from that of Linneus, and is to be preferred; as he examined all the parts accurately with a microscope. These plants are of the One-house class, and by Linneus are placed in the order three-stamens; but as on one filament are found one, two, three, or four anthers, it seems that they might more properly have been arranged in that of Polyándria, or many-stamens. What Linneus has called the calyx, from Mr. Curtis's observations, does not appear to be one, but rather some hairs proceeding from the receptacle, which is covered by them after the stamens are fallen off. These spikes of flowers are aments, or catkins, and their cylindric form marks the essential character of the genus. The male flowers are numerous, and terminate the *culm*, which is the term that Linneus gives

to the straw of grasses, and the reed-like plants. The female flowers are also numerous, and entirely surround the culm. The *typha* major, when it's spike of stamens is nearly ripe, makes a magnificent appearance; indeed, every part of this plant deserves attention: the root derives much beauty from it's fine moss-like fibres, and the shades of brown and green, with which the upper surface is varied.

The numerous genus *cárex*, in class Monœcia, one-house, may perplex a young botanist in the mode of their investigation, their flowers being small, and growing closely together; but, if each separate floret be examined before the anthers are arrived at maturity, their genus may be more easily detected than from their first appearance might be supposed. Particular attention should be paid to the state of the stamens in all plants of the catkin, or ament, kind; and if that circumstance is regarded they will not be found difficult of access. Some of the species of *cárex* are obviously distinguished by their outward habits. The *cárex pendula*, in whatever situation it is found, is distinctly marked by it's long pendant female spikes. These
are

are very slender while young, but become much thicker as the seeds ripen. Its fructification merits examination, as indeed does that of the catkin tribe in general.

It is necessary for the pupil to obtain some idea of the structure of the Cryptogamia plants; he should therefore begin with the ferns (filices). The plants contained in the class Cryptogamia have not yet been observed to bear either stamens or pistils; therefore, when the term fructification is applied to them, it has no farther signification than the seed, and the apparatus by which that is contained and dispersed. The whole tribe of the filices, or ferns, is divided into three sections, from the manner in which their fructifications are disposed. The first division consists of such as have their fruit in spikes; the second, of those which have it placed on the under side of their leaves; and the third, of what is termed by Linneus radical fructification; a specimen of which is well seen in the pepper grass (pilulária). The botanical world is much indebted to the accurate researches of the celebrated Hedwig for many important discoveries in the obscure families of plants belonging to Cryptogamia. Of the

spiked fructification a better specimen cannot be examined than the *equisetum sylvaticum*, at the time when it is beginning to disperse it's seeds; in the progress of which there may be observed appearances which seem to have a right to be considered as stamens and pistils. In the investigation of this plant recourse must be had to glasses; but it will be found more agreeable to view the parts through a microscope when some idea is obtained of their structure from engravings; and I recommend to the student, when obliged to have recourse to plates, to remember that he there relies on the authority of others; whereas in botany, as in all other things, small progress can be made if he does not take the trouble of seeing for himself. It is the observance of the rule, "See for yourself," that has rendered the works of Mr. Curtis so peculiarly valuable. Most of our botanical publications are taken one from the other: and thus, if an eminent botanist has, in the course of his researches, fallen into a mistake, the error has been propagated. Mr. Curtis, from his caution in this particular, has done more towards the improvement of the science, than any other writer with whom I am acquainted; and,

and, by his judicious and candid correction of the few errors in the works of Linneus, has rendered essential service to the botanical world.

But to return to the *equisetum*. Early in the spring this plant pushes out of the earth a little club-shaped head; round this head are placed, in circles, target-form substances, each supported on a pedicle, and compressed into angles, in consequence of their resting against each other before the spike expands. Beneath each of these targets are from four to seven conical substances, with their points leaning a little inwards towards the pedicle. They open on the inner side, and on shaking them over a piece of paper, a greenish powdery mass falls out, which at first is full of motion, but soon after looks like cotton or tow. All this may be seen without a microscope; but by the assistance of glasses green oval bodies have been discovered, and attached to them (generally) four pellucid and very slender threads, spoon-form, at their ends, as may be seen in Plate the Third. These small woolley substances have, to the naked eye, no appearance of distinct formation; but we may always be sure, that a nice and regular

organization exists in all the various parts of plants, though from the want of a proper method of investigating them this may not be always visible to us. These pellucid threads are almost constantly in motion, and are said to contract themselves upon the least breath of moist air, and, when wet with water, to roll round the green oval bodies from which they proceed. To see this requires more powerful magnifying glasses, and greater skill in the conduct of them, than may probably fall to the share of botanists in general; it will be well, therefore, at present, to take this curious history upon trust: but an outline of the discoveries of the most eminent botanists of our time ought to be known to all. Hedwig makes no doubt that these green oval bodies are the seeds, as they gradually increase in bulk, and when they fall the spike thrivels; that the projecting spikes are the stigmas, and the conical substances under the targets are the capsules, and the pellucid threads, with the spoon-form substances attached to them, the filaments and stamens; the seeds are numerous, egg-form, or globular, placed upon and lapped up within the filaments of the stamens. Future observations must confirm or refute this opinion.

nion. The different appearance of the supposed seeds, with their stamens, before the bursting of the anthers and afterwards, seems to be strongly in it's favour. The scales, or stipules, which surround the flowering-stalk at certain distances after it's protrusion, served, whilst it was young, as a general fence to the spikes. From the investigation of the *equisetum* a clear idea must be gained of the form in which it's fructification appears, and thence of that which may be found in the rest of the *généra*, which are arranged in the spiked division of ferns. We now come to that which contains the leafy fructifications, the elegant construction of which cannot fail to attract attention. The maiden-hair, a native of England, with it's purple stalks and scolloped green leaves, dotted underneath with innumerable small brown spots, affords a beautiful specimen of this curious mode of inflorescence. The syrup of capillaire derives it's name from the botanical appellation of this little plant, *capillus véneris*, and is supposed to be, in part, composed of it; the minuteness of it's parts renders them less proper for examination than those of the larger species of fern. The hart's-tongue (*asplénium*

scelopéndrium), from it's size, will show the fructification more distinctly; the first appearances of which, that can be observed, are some little bags, or cases of a yellowish or whitish green colour, placed in rows on the under side of the leaves; if these are opened, almost as soon as they become visible, there will be found capsules, or seed-vessels, very numerous, standing upright, and close together. At this time they appear to be of a green colour; as they approach towards maturity, they change this for a dark brown; at which period the cases open lengthways in the middle, and by the protrusion of the capsules, the two sides are turned quite back, and wholly disappear; this membranous substance may be considered as the same with the calyx in other plants, and serves to defend the tender capsules with their seed till ripe, when their curious mechanism strikes us with grateful astonishment at the benevolent and adequate care that nature takes of the minutest of her works. Each capsule consists of three parts, the foot-stalk, which supports and connects them to the leaf*; the

* See Plate Third of the Second Part.

jointed spring, which nearly furrounds the third part; or cavity containing the seeds. The seeds being ripe, this cavity is forced open by the elasticity of the jointed spring, and the seeds scattered and thrown to a considerable distance, one half of the cavity remaining connected to one end of the spring, and the other half to the other end. These capsules are an agreeable subject for the microscope; but it is difficult to manage them so as to gain a distinct idea of their progress. They are placed so closely together on the leaf, that it is necessary to separate them from it with a fine knife, before they can be distinctly seen. The warmth of the breath also, by occasioning the capsules to open and discharge their seeds, gives them the appearance of something alive. While we are intently looking at one, hoping to observe the operation, the strength and elasticity of the spring, at the moment of discharging, will often carry it out of sight; so that to see the manner of opening requires some dexterous management, and much patience.

The roots of some species of fern have the appearance of different kinds of animals; that

that of the polypódium vulgáre as nearly resembles one of the very large kind of caterpillars, as the root of the polypódium bárometz, if we may judge from the prints of it, does a sheep! This plant is described by many eminent botanists, as being deficient in the elastic ring, which furrounds the capsules, and by means of which they are burst open, and their seeds discharged. It would be extraordinary to find any of the fern tribe destitute of this seemingly essential part; neither has it yet been discovered, that they are so, by the accurate and diligent researches of Mr. Curtis, who ascribes this error of description to the blindly following the authority of figures; for had those authors, who have falsely characterized the polypódium vulgáre, from it's want of the elastic ring, made use of their own eyes, assisted only by a common magnifier, they must have seen, what had long before their time attracted the notice of inquiring botanists. At the same time it is not easy to account for the error of the ingenious Tournefort, who has delineated the capsules of the genus polypódium without rings; but this is one of the many instances which ought to deter
us

us from relying upon authority, be it ever so respectable. There is one circumstance attending this polypódium which does not run through the whole genus, that is, the want of the membrane, which, in the rest of the family, is found enclosing the capsules: of this, however, it may not be destitute, but it may have escaped notice from early falling off, when the capsules are arrived at a certain degree of maturity. This tribe of plants not having been much attended to leaves to modern botanists an ample field of discovery; and the whole class Cryptogámia is now become so much an object of inquiry to persons of the first ability in the science, that a few years will probably elucidate that obscurity which has hitherto rendered it a disgrace to Botany.

Having obtained a tolerably clear idea of the fructification of ferns, practice and attention can alone render the pupil familiar with the different génera; an undertaking in which he will find much difficulty. So great a similarity runs through the fructifications of them all, that the distinction cannot be founded on that part of the plant. The various modes, in which the capsules are placed on the frond,

or leaf, in some of them, are strikingly different, and appear to form very distinct and satisfactory characters; but when, as a tribe, they come to be more minutely investigated, the characters of one genus are frequently lost in those of another, and we in vain seek for a precise generic character. The plates and remarks in Mr. Curtis's London Flora are particularly pleasing and useful on this subject. The elegance of the figures of some of the *généra* is scarcely exceeded by their natural appearance. Wherever the ferns are found, they are ornamental; on walls, old wells, and banks, in winter, they make a principal feature in that beautiful assemblage of the *Cryptogamia* plants, which may be said to form a winter garden.

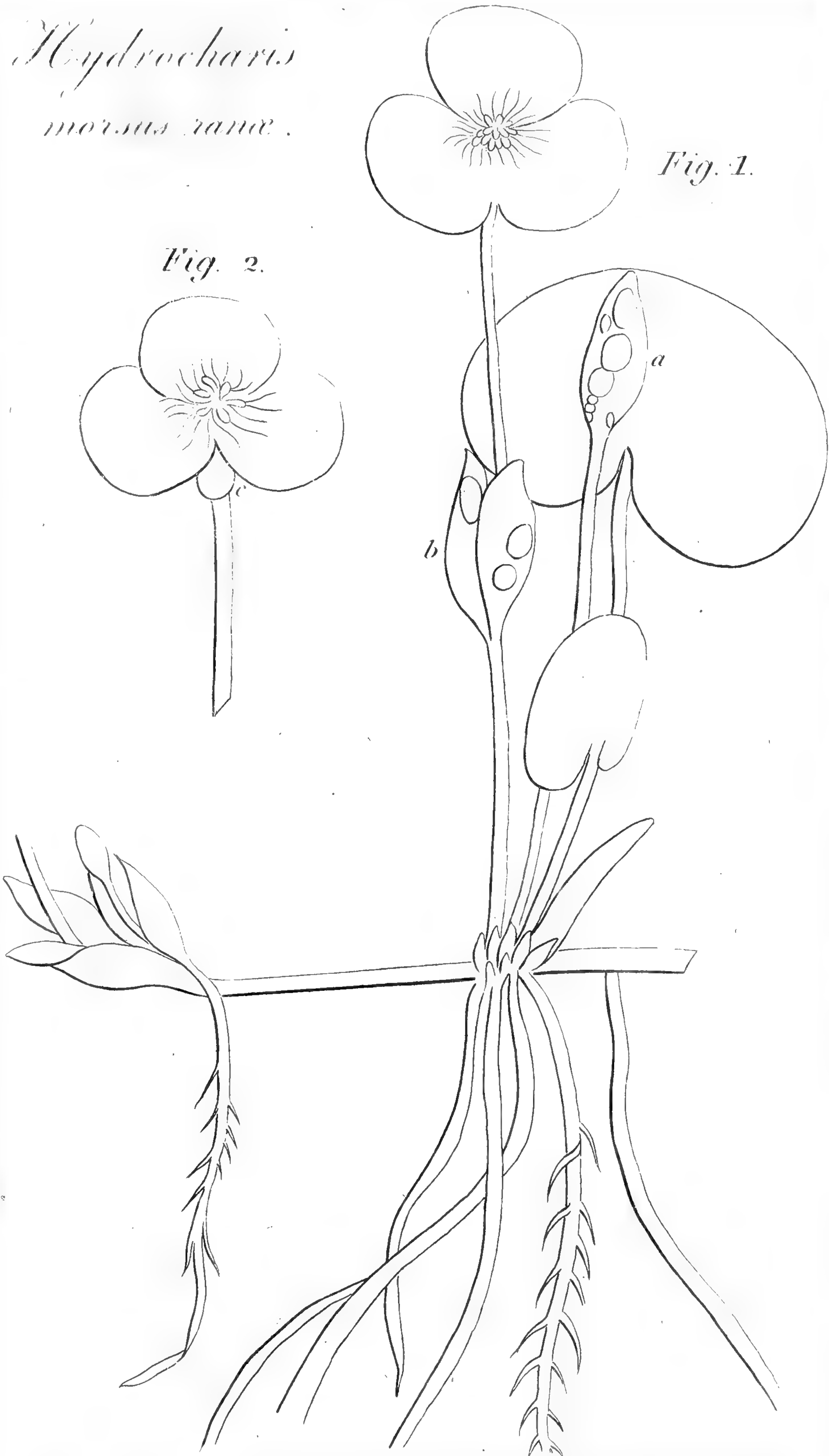
EXPLANATION OF PLATE II. PART II.

HYDROCHARIS MORSUS-RANÆ, FROGS-BIT.

- Fig. 1. A Plant of *Hydrócharis Morsus-ranæ*, Frogs-bit, to show it's outer habits and mode of growing. *a, b*, Transparent Sheaths, containing Flower-buds.
- Fig. 2. A Female Flower with the Germe, *c*.

Hydrócharis Morsus-ranæ.

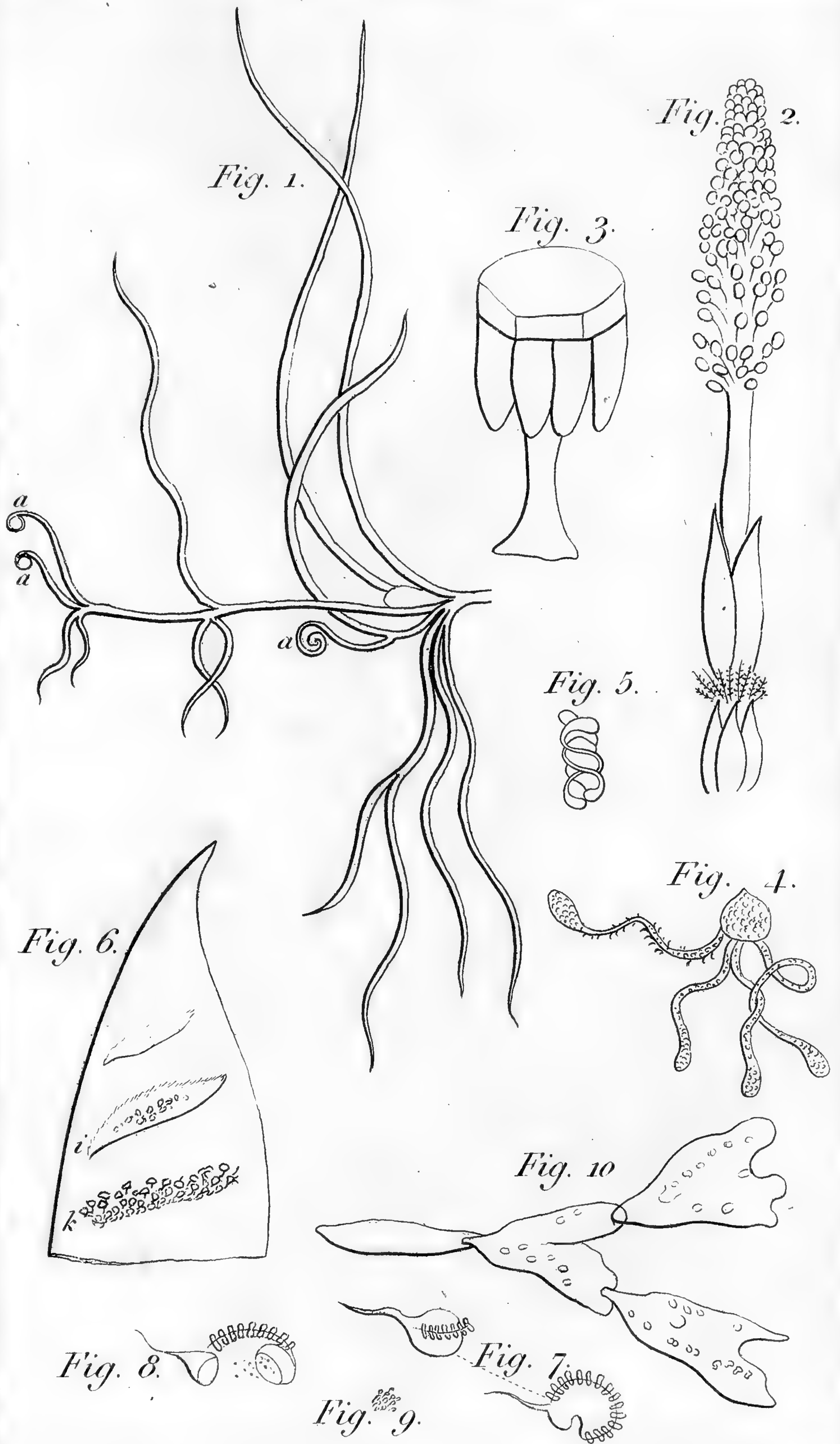
Hydrocharis
mosus ranae.



EXPLANATION OF PLATE III. PART II.

PRUCTIFICATIONS OF FERNS.

- Fig. 1. Part of a Plant of *Pilulária Globulífera*, Pepper-grafs, to show the radical fructification of Fern, *a, a, a*.
- Fig. 2. Spiked fructification of Fern, shown in *Equisétum Sylvaticum*, Wood Horse-tail, the Spike of the natural size, beginning to disperse it's seeds.
- Fig. 3. One of the Targets separated from the Spike, and highly magnified; termed, by Hedwig, a Capsule-bearing Target.
- Fig. 4. A Seed with it's Stamens highly magnified.
- Fig. 5. A Seed-bud with the Stamens rolled round it, before expansion.
- Fig. 6. Part of a leaf of *Asplénium Scolopéndrium*, Hart's-tongue, to show the leafy fructification of Ferns. *i*, An Involucre, or bag containing Seeds, not fully expanded. *k*, An Involucre expanded, showing the Capsules.
- Fig. 7. The Capsules in a magnified state, each surrounded by an elastic ring, and having one cavity.
- Fig. 8. A Capsule burst open, discharging it's seeds.
- Fig. 9. The Seeds magnified.
- Fig. 10. A Leaf of *Fícus Vesículosus*, to show the growth of one leaf out of another. See page 193.



LECTURE IV.

*On the Mosses, Flags, and Funguses. Musci, Algæ,
and Fungi.*

It is difficult to decide whether the palm of beauty should be given to the tribe of the ferns or the mosses; but from the extensive utility of the latter in the vegetable kingdom they lay a superior claim to our respect and attention. The beauty of their leaves is too obvious to require any explanation; but many persons are so insensible to their use, as to suppose that they impoverish the ground on which they grow. This is by no means the case; they thrive best in barren places, and love cold and moisture, and hence cover those lands with verdure which would otherwise remain bare: so far from injuring the plants, which are found intermingled with them, they afford them protection; their own roots penetrating to so small a depth into the ground, that they take from it little nourishment; wherever a small quantity of grass is found with mosses, there

N

would

would be none without them ; their leaves, being of the kind called ever-green, continue in vigour throughout the winter, and give shelter to the roots of the grafs which grows beneath them. In fpring the ftems of the mofs, like all other evergreens, become bare, and the ground is fspread over with a fine verdure from the graffes which at that feafon begin to vegetate ; and if the land is drained and manured it will be evident that the mofs has been no impediment to the growth of the grafs, even at the time of it's moft luxuriant foliage, as it will foon difappear after the improvement of the land, and the grafs will flourish even during the months of winter. A yet more effential ufe is derived from various fpecies of mofs, which grow upon the fides and fhallow parts of pools and marfhes ; in procefs of time their roots occupy the fpace which was before filled with water, and in their half-decayed ftate are dug up, and ufed for fuel, under the name of peat ; of the importance of which no one can be duly fenfible who can enjoy plenty of coal. It is not, however, from mofs alone that peat is derived ; fo that it muft not have more than a fhare of praife among other vegetables, feveral of which,

even whole trees, form the composition of peat beds. Young plants are covered with moss in order to preserve them from frost, or burning heat. The gardener wraps his newly-grafted trees with moss, as from it's power of retaining moisture a long time without putrifying it preserves them from the injuries of outward drought, and prevents the juices of the graft from evaporating. Since the time of Linneus it has been well established, that the musci, or mosses, have distinct fructifications, though botanists are yet divided in regard to their situation; but as these plants now have excited general attention, a few years will give us, I hope, a revival of the works of Linneus, with the improved knowledge derived from modern investigation: already an improvement in the class Cryptogamia has, I believe, been attempted and received; which encourages us to hope, we may see, at no very distant period, that division of extraordinary plants no longer a reproach to the science. At present, the outer habits, and situation as to the growth of the flowers or capsules, are chiefly made use of to distinguish the genera of mosses. These plants resemble pines, firs, and other ever-

greens of that tribe, in the form and disposition of their leaves, and manner of growth of their seed-bearing flowers, which are generally formed into a cone. Most of the mosses are perennial and evergreen; their growth is remarkably slow; their anthers, from their first appearance to the time of the dispersion of their powder, continue from four to six months. In some of the species the leaves are small and undivided, and have no visible foot-stalk, or mid-rib; in others, as in *hypnum proliferum*, they resemble the fronds of ferns. Their stamen and seed-bearing flowers are supposed to be placed apart; sometimes on the same, and sometimes on different plants. The calyx, termed by Linneus the calyptré, covers the tops of what he called the stamens. From the presence or absence of this cover, which falls before the opening of the supposed anthers, Linneus, after Dillenius, has distinguished the genera. After the veil, or calyptré, is taken off, there is found another cover to the anthers, which Linneus calls the opérculum, or lid. This is a beautiful microscopic object; and, with the other parts of the fructification of mosses, should be first studied by the assistance

ance of plates, and afterwards investigated by the agreeable amusement of microscopic observations. Before the parts of fructification are protruded, they may be seen by the assistance of powerful magnifiers enclosed within those small buds, which terminate the leaves of mosses, and have the appearance of being only a continuation of them. Hedwig discovered, that the leaves, or scales, composing these buds, differed materially from the leaves of the plant, and considers them as true involucre to the parts of fructification. He has also observed, that in the capsule-bearing mosses, which have their cones situated towards their extremities, the leaves adjoining the fruit-stalk are much more beautiful than those of the stems. Sometimes the inner leaves become gradually smaller, and those nearest the fructification so very minute as to make it impossible to take them away without a microscope. These involucre, like the calyxes of many other well-known plants, grow larger as the capsules advance towards maturity. Hedwig gives so minute and particular an account of both the stamen and seed-bearing flowers of the whole family of mosses, that, if he has not been deceived in his researches, we may

expect soon to see a greater progress made in the knowledge of this difficult tribe of plants, than some years ago it appeared probable would ever be attained; but as these researches were made by the assistance of the most powerful magnifiers, and with every advantage that could be procured, much information will not be gained from his plates of the natural plant. From Mr. Curtis's descriptions and figures the species delineated by him may be clearly understood. He recommends to the notice of young students the *bryum undulatum*, and curled bryum, as their parts of fructification are large and distinct. Mr. Curtis does not pretend to decide the question, whether the powder, from what is called the capsule, is anther-dust, or seed. Hedwig asserts, that these capsules are true seed-vessels, and tells us, he sowed them, and repeatedly procured from them a crop of young plants, similar in all respects to the parent plant. Dillenius sowed these cones frequently, but without success: it is probable that the situation of the stamens and pistils under one or distinct covers may have occasioned such different results from the experiments of these eminent botanists. In the curled bryum, the

the capsules or anthers are cylindrical, bent inward, and if magnified they appear somewhat striated. Their colour is first green, then livid brown, and lastly of a reddish brown colour. The bottom of the opérculum, or lid, is convex and red; the top paler, very slender, and rather blunt; the mouth of the capsule is fringed, and the fringe bent inward; the ring is red, and the powder, which issues from the capsule, be it seed or anther-dust, is green. Hedwig has observed, that this fringe of the capsule in dry weather expands, and leaves the mouth of it open; but on the least moisture, even of the breath, it closes again. He remarks, the ring of the capsule of some species is elastic; and, when the seed is ripe, throws off the veil with more or less force; and it is after this veil, or calyptré, is gone, that the fringe serves to protect the precious contents of the capsule. The calyptré in *bryum undulatum* is of a pale brown colour, terminating in a long point, first upright, but afterwards, on the bending of the capsule, it bursts at the bottom, and remains straight, with its base at some little distance from the capsule*.

* A plate is given of the different parts of mosses for those who have not the advantage of consulting Mr. Curtis's London Flora.

The mechanism of the fructification of the mosses, and that of the ferns, is truly admirable. Both seem intended for the formation, protection, and dispersion, of their seeds, or of some substance equivalent to it; but, unless we credit the plates of Hedwig, we are equally ignorant of the manner in which this seed is produced in both tribes. In the magnified leaf of the *bryum undulatum* the circumstance may be seen which has given it's specific name, the leaf being waved at the edge. This moss produces it's fructification from November to February, and is commonly to be found either in woods or on heaths; it's leaves soon curl up, after the plant is gathered; seldom more than two peduncles arise from one stem, generally only one; they are both longer than the stem, upright, and of a reddish colour.

Mr. Curtis has given a beautiful specimen of a moss, which he has thought proper to place under the *bryum* genus, although arranged as a *mnium* by Linneus. On the first view it is distinguishable from the *bryum undulatum*; it's bending peduncles, which have occasioned it to be called the swan's-neck *bryum*, are an obvious character in this species; added to this, is the star-like appearance,

ance, which terminates those stems from which the capsules do not proceed: these stars are supposed, by some authors, to be the female parts of fructification. Mr. Curtis, with very accurate investigation, was not able to discover any thing in their structure, in the least similar to any of the parts of fructification in other plants. Hedwig asserts, that these star-like appearances are the involucre of the stamen-bearing, or male flowers, and makes no doubt of the capsules containing the pistils, or female flowers. If the stars and capsules are really distinct parts of the fructification, it seems probable, from the situation in which they grow, that the stars contain the females, and the capsules the males; or some of the *généra* of mosses may possibly have flowers of all kinds, like those plants which compose the class *Polygámia*. On this obscure subject I have thought it necessary to give some idea of the opinions of different botanists, lest, by detailing only the descriptions of particular individuals, I might lead my readers to form too decided an opinion upon a point, which is not yet sufficiently clear to justify any thing further than conjecture.

The

The examination of two other kinds of moss will give a pretty good idea of the parts which the young student may expect to find in their different génera. The one first to be considered is the hy'pnum prolíferum. The hy'pnum and bry'um families are separated by Linneus from the situation of the peduncle, which supports what he terms the anthers, but which later writers have agreed to call the capsule. This in the bry'um grows out of the top of the stem, and is furnished at it's base with a little naked tubercle, or bulb. In the hy'pnum the peduncle grows out of the side of the stalk; and the tubercle at it's base is covered with leaves. This elegant species of hy'pnum derives it's specific name, *proliferous*, from the singular structure of it's leaves, or fronds; one large shoot proceeding from the middle of another repeatedly; and these shoots extending themselves along the ground, and taking root. Linneus found this beautiful plant in one of his journies through Sweden, growing in the thickest woods, obscured by perpetual shade, and where no other plant could exist. This plant is not often found in a state of fructification, though by diligent search it may be so. It's time of fructifying is

is from December to February. The structure of the capsules will be found nearly the same in all the mosses. Mr. Curtis has, however, discovered some peculiarities in those of *bryum subulatum*, or awled *bryum*, and in *polytrichum subrotundum*, or dwarf *polytrichum*, which are worthy of further attention. The *bryum*, after it has lost it's calypstre and opérculum, protrudes from it's mouth a substance, which by magnifiers is found to consist of a number of filaments, forming a thin spiral tube, loose and unconnected at the top: this tube may be seen through the transparent opérculum, forming in it's young state a small spiral line. Mr. Curtis does not even conjecture what may be the use of this extraordinary appendage; it may perhaps be the receptacle of the seeds within the capsule, which, on arriving at maturity, bursts open the covers, and disperses it's contents. To ascertain this, there should be sowed repeatedly a great number of these capsules, with and without the tubes, and the tubes without the capsules. There would, however, be great nicety in the time that these capsules were gathered: it is possible that, at the moment of protrusion, the vegetating power may be lost;

lost; it should, therefore, not be too hastily concluded that it did not reside in these filaments because young plants are not obtained from them; or if the capsules are sowed, while their covers remain, and give no produce, it cannot be decided that they were incapable of doing so, as they might not be in a state sufficiently mature.

The beautiful and curious structure of the capsules of the *polytrichum subrotundum* are well worthy of the trouble of investigation; particularly as Mr. Curtis has found their peculiar construction to be a constant character belonging to the genus, so far as he examined those species which he could procure. The capsules of mosses in general have only one veil or calyptra; in this genus there are two within the woolly calyptra of the *polytrichum*, which has the appearance of a little distaff covered with flax. He found a membranous shining substance, closely connected by its top to the inside of the woolly one, which is peculiar to this genus, but which was scarcely visible, except by totally inverting it; by doing so, it is visible to the naked eye. This inner calyptra differs very little from that of other mosses; at first it wholly surrounds

rounds the unripe capsules; as they increase in size, it splits at the bottom, and finally becomes very short.

The beauty and curiosity of the structure of the capsules of mosses, with their whole elegant apparatus, may have detained me too long upon this subject; but it is my wish, by interesting my readers in the history of their outer habits, to induce some of the more inquiring among them to enter upon an accurate investigation of their parts and properties. If the account I have given of some of the genera is in any degree found amusing, it is to Mr. Curtis I am indebted for the power of having made it so. To those who can have access to his accurate and elegant plates, with his observations thereon, the class *Cryptogamia* must be peculiarly interesting. But his *London Flora* being a work of too much expense to be of general utility, I am happy to have it my power to recommend to my readers the figures and observations on this difficult class, which may be found in *Dr. Smith's English botany*. To his accurate descriptions by the pen, and those of the pencil by Mr. Sowerby, we owe much information on the *algæ* tribe, which is now to be

be explained. The plants comprised under the description of algæ, or flags, scarcely admit of a distinction of root, stem, or leaf; much less are their flowers sufficiently obvious to admit of a definition of their parts, though, by the situation of their supposed flowers, or seeds, the généra are distinguished, or sometimes by the resemblance of the whole plant to some other substance with which we are familiar in the economy of nature. This tribe of plants is of great importance, as they frequently afford the first foundation, from which other plants draw nourishment. One species of byffus, and several species of lichen, fix upon the barest rocks, and are supported by what slender supply the air and rains afford them. Dr. Smith, in his tour on the continent, in the years 1786 and 1787, found near Mount Vesuvius, on a torrent of lava, which issued in 1771, the lichen paschális, which covered it most copiously, and had the appearance of hoar frost, with no other plant near it. The lichen paschális is peculiarly fitted for the beginning of vegetation on the hard surface of lava, from it's shrubby figure, and slender roots; in the same manner, the thread-form lichens insinuate their roots into crevices in the

the

the bark of the oldest trees, while the broad crustaceous kinds cover young bark, and the smoother sorts of stones and rocks. The lichen *paschalis* being a perennial of very slow growth, many years elapse before it's crumbling branches fall into the cavities of the lava, and there decaying form vegetable mould for the nourishment of other plants. By attentive observation the progress, in which such vegetable mould is formed, may be seen on the smooth and barren rocks upon the sea-shore; and by a knowledge of the decaying plant we may know that, which will next succeed. After the by'ffus and several species of lichen have crumbled into dust, first appear other species of lichen, which require a deeper soil for their sustenance. When these perish, and have again more thickly covered the rocks with mould, various kinds of the mosses appear; in their turn these also decay, when their places are supplied by other plants, till a sufficiency of earth is accumulated to afford nourishment to the largest trees. It has been before observed, that some of the species of lichen are used in dying; one of them, *lichen roccella*, called the orchel or argel, is brought from the Canary islands, and forms a considerable

derable article of traffic. They are a grateful food to goats, as well as to the rein-deer.

That beautiful vegetable called the cup-moss is the *líchen pyxidátus*, or box-lichen. There is great difficulty in ascertaining the species or varieties of the numerous plants of this genus. According to Hedwig's investigations the cup and faucer-like appearances, which are found on the various species of lichen, are to be esteemed the seed-bearing flowers; and the notches, and warts with black tops, those which contain the stamens. He asserts, that the fringes from the *líchen ciliáris*, fringed lichen, which take root, and the downy matter on the surface, have nothing to do with the real parts of fructification. He gives very particular accounts of these parts, with plates of several genera of the *algæ* tribe; but the whole of these plants is at present so little understood, that it is not easy to give any accurate information concerning them. It is possible that too pertinacious an inquiry after the mode of seminal reproduction in all the orders of the *Cryptogamia* class may tend to retard rather than accelerate our knowledge on the subject. The plant called sea-wrack is of the *algæ* tribe,

tribe, and of the *fucus* genus; it has it's specific name of *vesiculous* or *bladdered*, from the bladders which cover it's surface. If the leaves of this vegetable receive an injury or fracture, while the plant is in a vigorous state, abundance of young leaves are thrown out from the injured part; even if a small aperture be made in the middle of a leaf, a new one arises from either side of it.

This species of *fucus* is frequently seen with black hairy tufts, like horse-hair, which are commonly supposed to be a part of the plant; but this is not the case; these tufts are distinct vegetables of the *conferva* genus, which attach themselves to the bladder *fucus*, and appear to belong to the plant itself. There are some species of *fucus* which perhaps, on further investigation, may be found to partake more of the animal than of the vegetable kingdom, in the same manner as the sea anemone; which was believed, till lately, to belong to the latter. The green scum, which we see on stagnant water, and the green films on trees, are but just now beginning to be properly inquired into. In a course of years the whole class *Cryptogamia* must undergo a different arrangement; and there is not any one of

O

the

the four orders, of which it consists, requires it more than that which is now under consideration; neither can there be found, amongst the *généra* contained in it, a common character strong enough to assemble such a variety of families, which apparently differ in many striking circumstances: they all seem to possess peculiarities, which are well worthy of investigation; the beauty of the lichens attracts our notice in winter on every tree, and bank, and wall, as they form a conspicuous part of that elegant arrangement, which is always found in an assemblage of the *Cryptogamia* families. That beautiful little plant, which is seen on heaths, and commonly called white moss, is the rein-deer lichen; a knowledge of it's use to the starved inhabitants of the northern climates gives us an interest in it, even beyond what necessarily arises from it's elegance of structure. There are many varieties of this plant, from which the true species is distinguishable by it's very different appearance, although found in the same places. The *lichen sylvaticus*, wood lichen, which is only a variety of the *rangiferinus*, has uniformly it's branches of a reddish brown colour, and it's stalks smaller, and sometimes beset

beset with minute crisp leaves, and the whole plant with age turns brown ; neither of which ever happens to the rein-deer lichen, it's colour always being white. What is commonly called moss on trees, is also a lichen. This elegant tribe of plants well repays the trouble of investigation ; and, with the mosses, ferns, and funguses, furnishes the botanist with a complete winter garden.

The fourth and last order of the class Cryptogamia contains the fungi, a tribe of vegetables, which, although they cannot vie with the filices, musci, or lichens, in beauty or elegance, are not destitute of either, and, from the curious mechanism of their structure, cannot fail to interest an inquiring botanist. Mr. Curtis's, Mr. Bolton's, and Mons. Buillard's plates will be great assistants in the study of these vegetables ; also Mr. Sowerby's collection of fungi will be found highly serviceable. The delicate botanist turns away with disgust from the smell and disagreeable touch of some of the fungi généra ; but the generality of them may be dissected by persons of the greatest nicety without giving offence. Within the last twenty years our knowledge has been greatly improved in regard

to the fructification of the fungi, as well as that of the other three orders of the class Cryptogamia, but yet remains so imperfect, that their generic characters continue to be taken from their outer form. Hedwig's researches tend to establish for a fact, that the fungi possess all those parts of fructification which, in botanic language, constitute a flower, viz. stamens and pistils. The stamens he conceives to be a collection of pellucid succulent vessels, with which innumerable oval globules are connected, of a dilute brown colour. These small bodies he discovered under what is called the curtain, a part which is found in some funguses, and not in others. This is a thin membrane extending from the stem to the edge of the hat, which is torn as that expands, and soon disappears; but the part attached to the stem often remains, and forms a ring round it. The parts supposed by Hedwig to be the pistils, he found, in examining a portion taken from one of the gills, which he divided with some difficulty into two plates, the lower edge thickly set with tender cylindrical substances; some with globules at their extremities, and some without: the gill itself appeared netted with larger and more distinct spots,

spots, a little raised. In another fungus, a species of agaric, after the curtain was torn, and the hat pretty fully expanded, with the gills turned yellow, he found the upper part of the stem beginning to be tinged by a brown powder, shed from the gills. On examination he did not scruple to pronounce this brown powder to be the seeds, and that it proceeded from the larger spots, that he had before observed in the gills; the two folds of which now readily separated. He asserts, that he has uniformly found in the genera of *agáricus* and *bolétus* the globules, which he believes to be stamens, either on their upper or inner surface. In those agárics, which have neither curtain nor ring, these globules, with their threads, are placed upon the stem.

Having given a sketch of the modern discoveries in these obscure vegetables, the outward habits and structure of the fungus tribe may be examined; and from the variety in these circumstances the student may endeavour to gain some knowledge of the characters of the different genera. The researches of Hedwig having been made with glasses of highly magnifying powers, the parts which he has discovered can never serve for the

distinction of the *généra*; in which the character being obvious and clear constitutes the excellence of it. It is, however, very desirable, that such researches should be made. It is a decided fact, that funguses continue their species by a powder, which is visible in the gills of many of them, and which is generally allowed to be seed. Some species of the *agáricus* have so short an existence, that from the time of their appearance to the time when they begin to decay, is not more than five days. The manner in which many of them decay, is by their gills dissolving into a very black liquor, like ink, that, dropping, carries with it the seed; which may be seen in the liquor, if greatly magnified. The structure of one of this genus should be investigated, as it is the most numerous of the fungus tribe, and, if well understood, will bring the student acquainted with the *bolétus*, and other *généra* of this order. The *agarics* are composed of a *pileus*, or hat with gills underneath, and with or without *stipes* or stems, the position of the *stipes* being either central or lateral; from which arise the three first divisions of the genus; they have also a root, more or less obvious; and

some of them, while in their unfolded state, are wholly enclosed in a membranaceous, or leathery case, called the volve. This case must not be confounded with that part so termed by Linneus. Mr. Bolton has shown us the just distinction betwixt the volve, and the veil or curtain, the latter being what Linneus has marked as the calyx, under the term volve; which has occasioned a confusion in these two parts, though in reality none can be more evidently distinct, applicable to different purposes: the volve wrapping round and protecting the whole plant in it's infant state; the veil apparently belonging to the supposed parts of fructification only, which Hedwig asserts he has found under it. From the remains of the veil a ring is formed: this part is not only uncertain in it's time of duration, but even will appear in some years on the stipe, and not in others; consequently it cannot be used as a permanent character. The stem of an agáricus is either solid or hollow; the solid stem differs much in it's degree of solidity, sometimes being as solid as the flesh of an apple, and sometimes perfectly spongy. Next to the gills, the stem of an agaric is the part least

liable to vary. The gills are the part commonly known by that name, and with which every one is acquainted; they assume different colours in different species, and vary much in their respective lengths; each gill consists of two membranes, and between these the seeds are formed; the gills are always attached to the hat, and sometimes to that only; sometimes they are not only fixed to the stem, but extended along it downwards, like the wires of an umbrella. This has been called a *decurrent gill*. Mr. Curtis discovered a peculiarity of structure in the gills of the *agáricus ovatus*, which he had not before observed in any other fungus: the gills are connected together by numerous transverse bars, or filaments, the use of which seems to be to keep them at an equal distance from each other, and thus to admit the air to the fructifications, which are situated on the flat surface of the folds, and to prevent their being destroyed by pressure from their too great closeness. These bars make it extremely difficult to separate one of these folds entire: they are visible only when greatly magnified. The secondary subdivisions of the agarics are founded upon the solidity or hollowness
of

of their stipes with the position of their gills, which, being the part wherein the fructifications are contained, is of the greatest importance. They vary much in almost every circumstance belonging to them, except in colour, which in all other plants is the most variable of all their characters; the colour of the gills, on this account, is the mark, which has lately been adopted for the distinction of the species: their colour is supposed to be principally, if not wholly, caused by that of the fructification or seeds, and is said to have been found sufficient, with their structure, to afford permanent specific distinctions. These colours change, when the plant begins to decay; and of those agarics, which dissolve away in an ink-like liquor, the gills in their young state are white; so that, to judge of their colour, the plant must be gathered in it's first state of expansion, when they will be found to be gray. It is the colour of the flat side of the gills which must be attended to in the system I am explaining to you, because the colour at the edge in some plants is different through all the stages of growth; and in others, it changes sooner than that of the sides, evidently from the discharge of the
seeds,

feeds, when ripe. The hat of the agarics is least to be depended on; its shape is either conical, convex, flat, or hollowed; the top like a funnel. It is constantly varying in the same plant before expansion, but not very changeable in the same species, when it is nearly, or fully expanded. The colour of the hat is extremely uncertain, therefore can only be attended to as a mark of varieties. The viscous juice on the hat and stipe, which is seen in many agarics, differs, according to their situation, or to the state of the atmosphere, so much, that the same species will sometimes be found glutinous, and at other times perfectly dry. Some of the agarics contain a milky juice, more or less acrid: this circumstance is not constant, it having been found in the *agáricus rubescens*, and the *agáricus cæfareus*, that plants equally vigorous, and in the same situation, will some of them pour out milk in abundance on being wounded, while others will not exhibit any marks of it.

Upon the principles here explained, the late Dr. Withering has given to the world an arrangement of the funguses, from which the *généra* may generally be investigated. It must
be

be remarked, that an exception to the uniformity in the colour of the gills takes place in the *agáricus aurantius*, which species exists under every kind of colour that can be imagined. There is a variety of the *agáricus integer*, entire agaric, which has it's hat of a blood-red colour, and which appears from August to October. The colour of many of the funguses is beautiful; the most splendid of all the agarics is the *cæfareus*, which in England is a rare plant, but is common in Italy, and brought to the markets for sale.

The plant we eat under the name of mushroom, is the *agáricus campestris*, which the gardeners propagate, either by sowing the gills, or by planting small fibrous shoots, which are found about the base of the stipe, and which produce tubercles, in the manner of potatoes. It may be difficult to assign a reason for the exclusive preference given by the english to this fungus, as an article of cookery. The caprice of mankind in their choice or rejection of particular kinds of food is not easy to be accounted for. The *agáricus campestris*, however, seems to justify the distinction that has been given to it, as an esculent vegetable, from the fineness of it's flavour,
and

and tendernefs of texture. But although we make ufe of it at our tables, almoft exclufively, it has not the fame preeminence in other countries; and the inhabitants of Ruffia devour almoft every fpecies, even thofe which by other nations are efteemed poifonous. The noxious qualities of mushrooms may be doubted of. Inftances of injury from the culinary ufe of the fungi tribe are certainly rare; and when they have occurred, it has remained doubtful, whether the poifon proceeded from the mushroom, or from the veffel in which it was drefled. But as mushrooms make a part of our diet more palatable than nutritive, it can never be neceffary to eat them; and particularly if they are found hard it will be prudent to refrain from doing fo, as it is probable the poifonous effects recorded of them may fometimes have arifen from want of fufficient ftewing; for we have daily experience of the falutary ufe of fire to many of our vegetables, which in their frefh ftate would be fo far from affording wholefome food, that they could not be eaten without producing pernicious confequences. And the difufe of any particular fpecies of diet is of lefs confequence to highly civilized nations, whose

whose luxurious inhabitants have articles of food procured for them from every quarter of the world, and can thence form but faint ideas of the necessitous situation under which many of the inhabitants of the globe exist, and in comparison of whom our poorest cottagers may be considered in a state of ease. In the rigorous and unfertile climates of Sweden, Lapland, and Kamschatka, that necessity obliges the inhabitants to make use of the inner bark of the *pinus sylvestris* (scotch fir) for food. In the spring season they choose the fairest and tallest trees, and, stripping off the outer bark, they collect the soft white succulent interior bark, and dry it in the shade. When they have occasion to use it, they first roast it at the fire, then grind it, and after steeping the flour in warm water to take off the resinous taste, they make it into thin cakes, which are baked for use. The poor inhabitants are sometimes constrained to live upon this food for a whole year, and are said to be fond of it; and it should be nutritive, as Linneus asserts that it fattens swine. Nor ought we alone to estimate the vegetable tribes by the use to be derived from them to the human species. The funguses, which

which are apt to be regarded in too insignificant a light, afford sustenance to a numerous swarm of the animal creation, a variety of insects. Although the *pinus sylvestris* is unknown to more genial climes, as affording an article of food, it has been applied by mankind to more uses than most other trees. The tallest and straightest are taken for the masts of ships; the timber is resinous, durable, and applicable to many domestic purposes; such as making floors, wainscots, boxes, and all those things which are made of deal; which is the name given to the wood of this fir-tree, when sawn into planks. From the trunk and branches of this, as well as of most others of the *pinus* tribe, tar and pitch are obtained. Barras, Burgundy pitch, and turpentine, are acquired by incision. In the highlands of Scotland, the resinous roots are dug out of the ground, and divided into small splinters, which are burnt by the inhabitants to supply the place of candles. The most important use, we have observed, is made of the inner bark by the Swedes, Laplanders, and Kamtschatkans; of the same material, the fishermen at Lockbroom in Rosshire make their ropes. This species of
fir

fir has acquired the name of scotch, from being the only one which grows naturally in Scotland. It is found scattered in many places amongst the Highland mountains; and large natural forests of it are seen of many miles extent in various Lowland districts. From the cones of this fir a resinous oil is extracted, which is said to possess virtues similar to those of the balsam of Peru. This tree lives to a great age; Linneus affirms four hundred years. The anther-dust in spring has been carried away by the winds in such quantities, as to have alarmed the ignorant with the idea of a shower of brimstone.

The last genus of the Cryptogámia class to be considered is mucor, or mould. It would scarcely be supposed, that the mould found on bread, fruits, leaves, and various other substances in a decaying state, was a plant subject to all the laws of the vegetable kingdom. That it is a plant of perfect form may be seen by the assistance of a microscope of common magnifying powers. It will be found growing in clusters; the stems a quarter of an inch high, pellucid, hollow, and cylindrical; each supporting a single globular head, which at first is transparent, afterwards dark gray; these
heads

heads burst with elastic force, and eject small round seeds, which are easily discoverable by the microscope. It is the *mucor mucedo* which is here described; but there are thirteen distinct species of mould, or *mucor*, which appear at different times of the year; one kind, called the golden, from its brilliant yellow colour, covers the whole surface of plants, on which it grows, and stains the fingers yellow, if touched. It is generally found upon the plants belonging to the *bolétus* family, and has the property of repelling moisture. It is said to remain free from wet, though immersed in water for a year. Great indeed are the wonders of nature in all her works, and in none more than in those of the vegetable kingdom!

EXPLANATION.

EXPLANATION OF PLATE IV. PART II.

FRUCTIFICATIONS OF MOSSES.

- Fig. 1. A Plant of *Bryum Undulátum* of the natural size.
- Fig. 2. The Capsule much magnified with it's Calypstre.
- Fig. 3. The Calypstre separated from the Capsule.
- Fig. 4. The fringed Mouth of the Capsule.
- Fig. 5. The Fringe, with the Ring taken off the Capsule.
- Fig. 6. The Opérculum of the Capsule.
- Fig. 7. A magnified Leaf of *Bryum Undulátum*.
- Fig. 8. A Plant of *Bryum Hörnum*, Swan's Neck *Bryum*, to show the Rose or Star which terminates some of the Leaf-stems, *a*.
- Fig. 9. A Plant of *Hypnum Prolíferum*, to show the manner of it's leaves growing out of each other, and of the Capsules being placed on the Stem, *b*.
- Fig. 10. A Leaf greatly magnified, to show it's granulated appearance.
- Fig. 11. The Capsule with it's Fringe. *c*, The Opérculum separated from the Capsule.
- Fig. 12. The Fringe with it's Ring, separated from the Capsule.

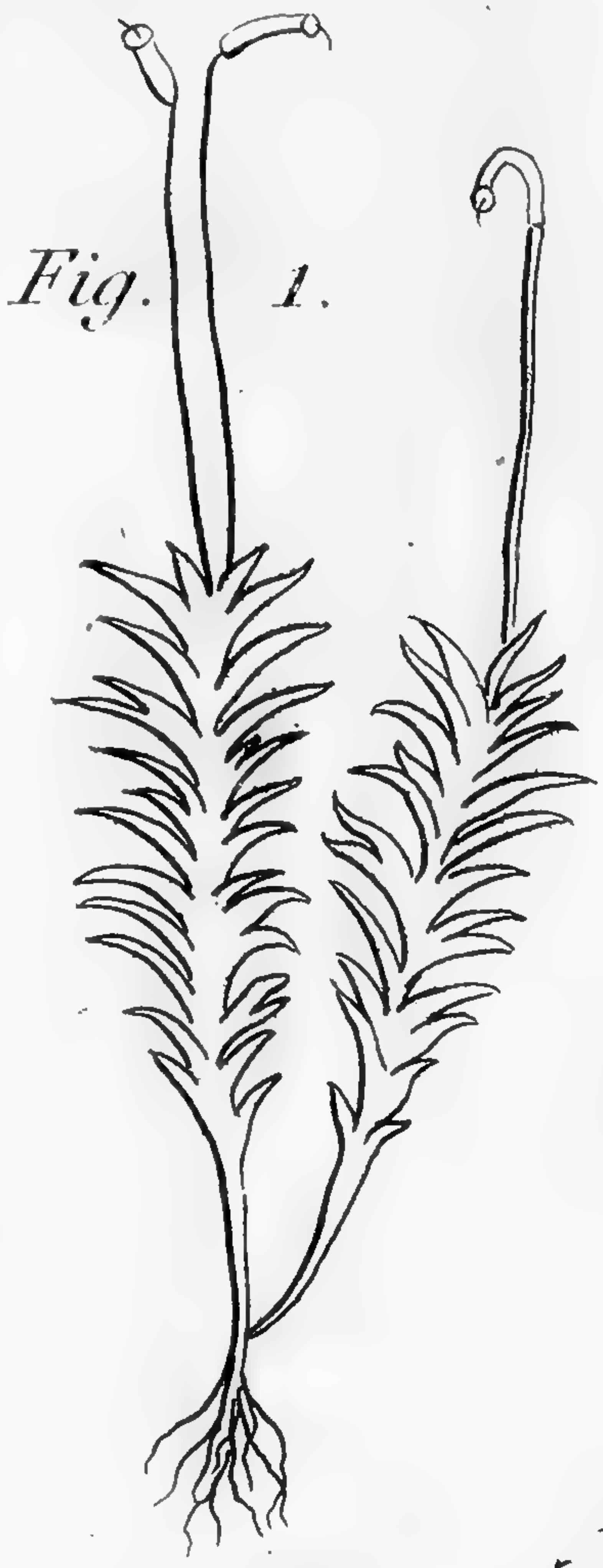


Fig. 1.

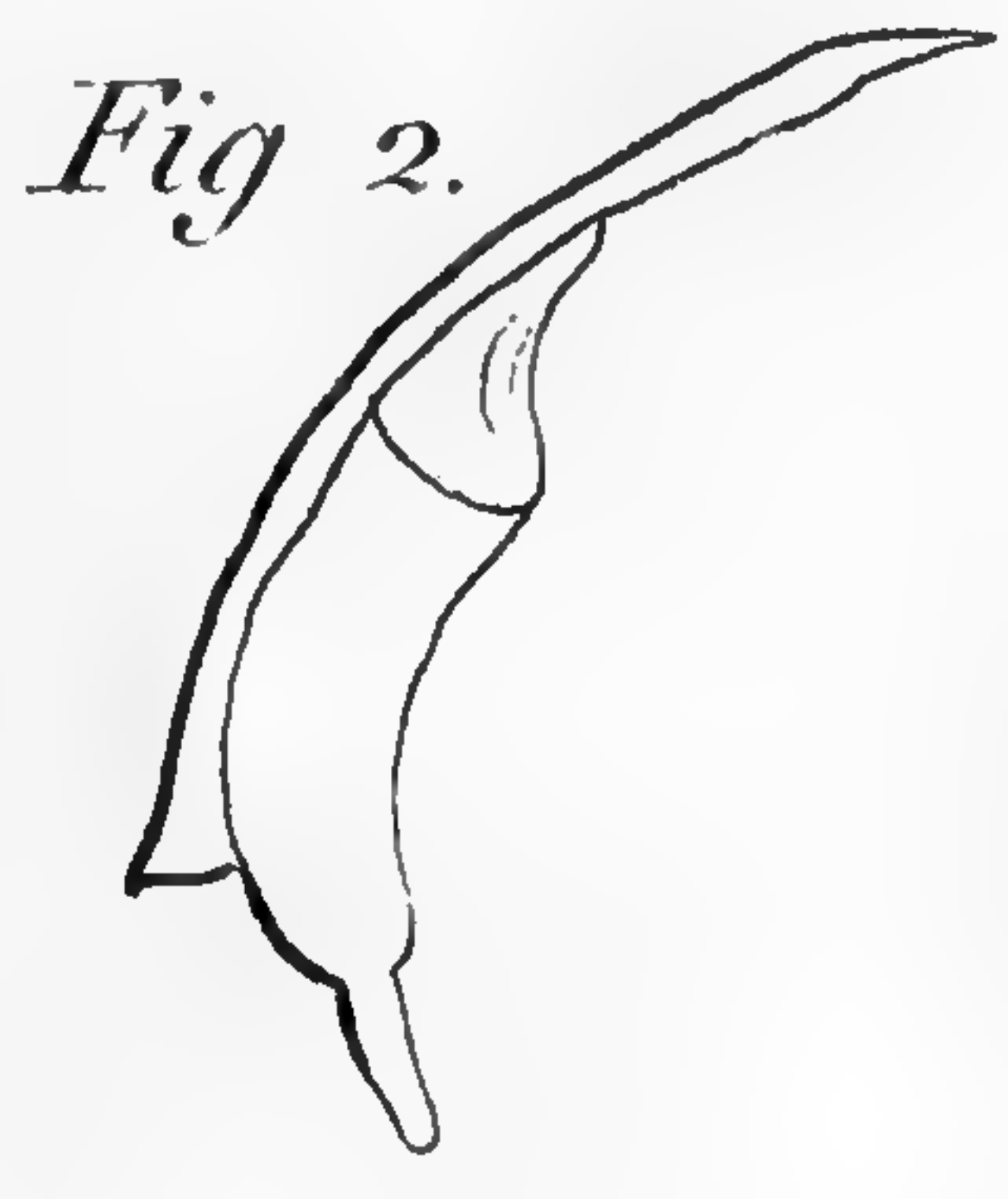


Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.

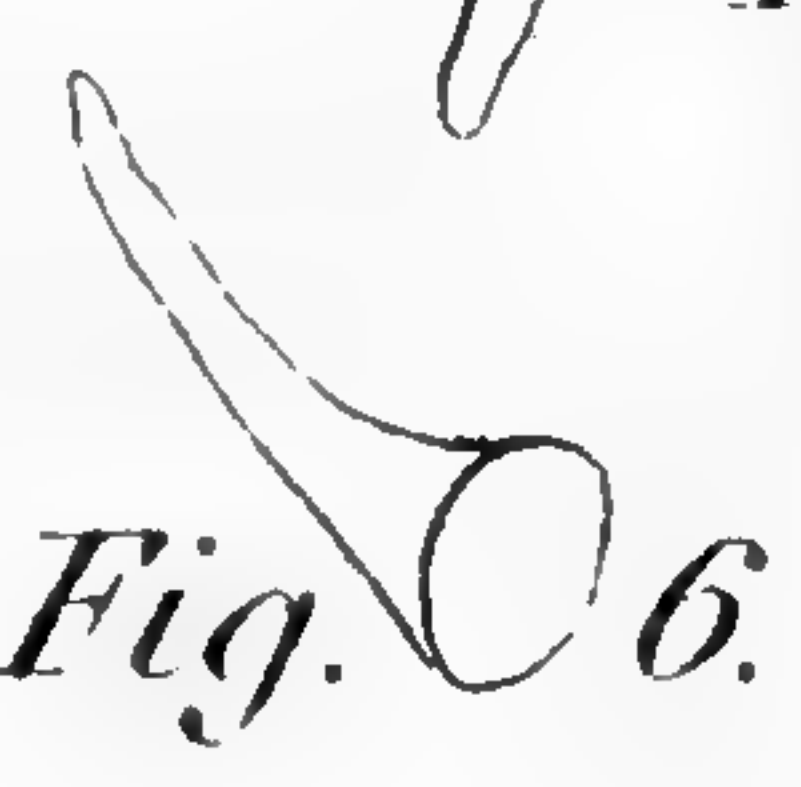


Fig. 6.

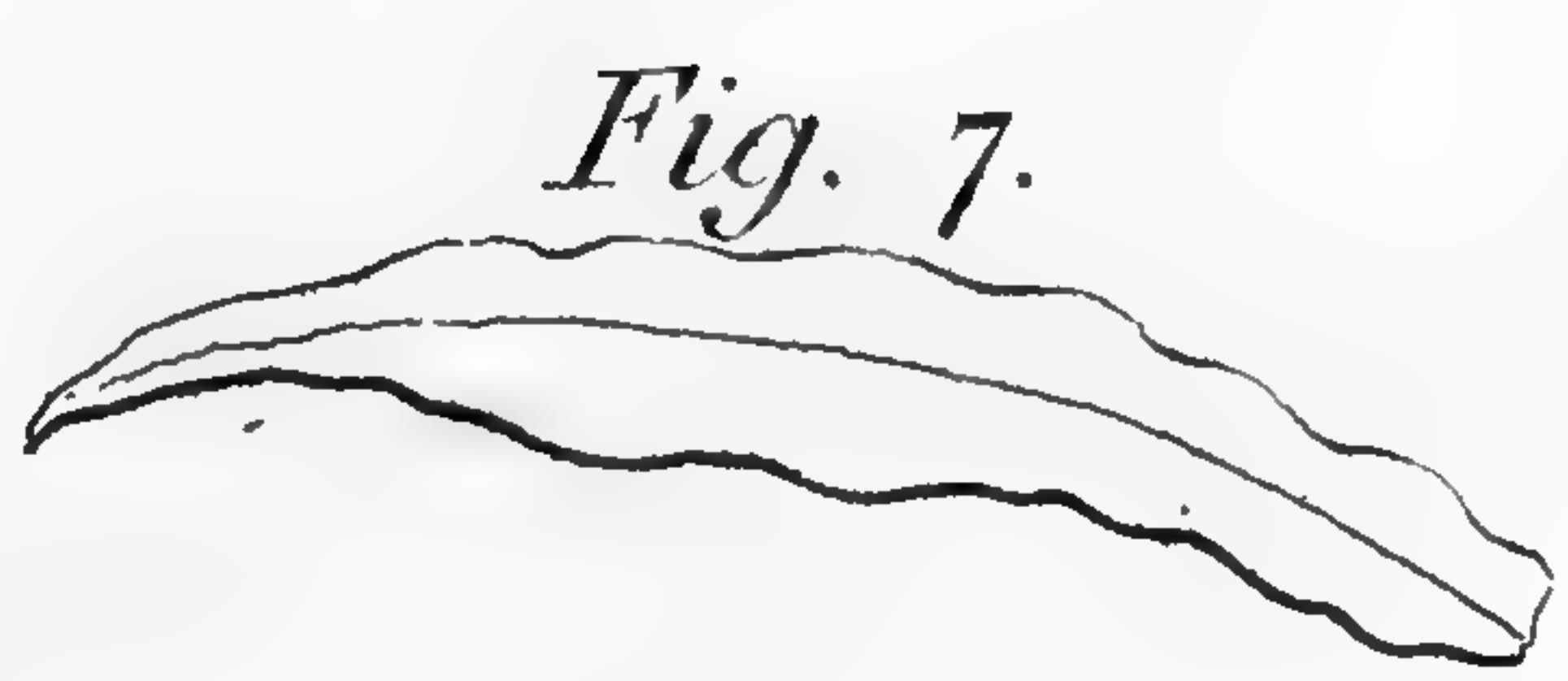


Fig. 7.



Fig. 9.

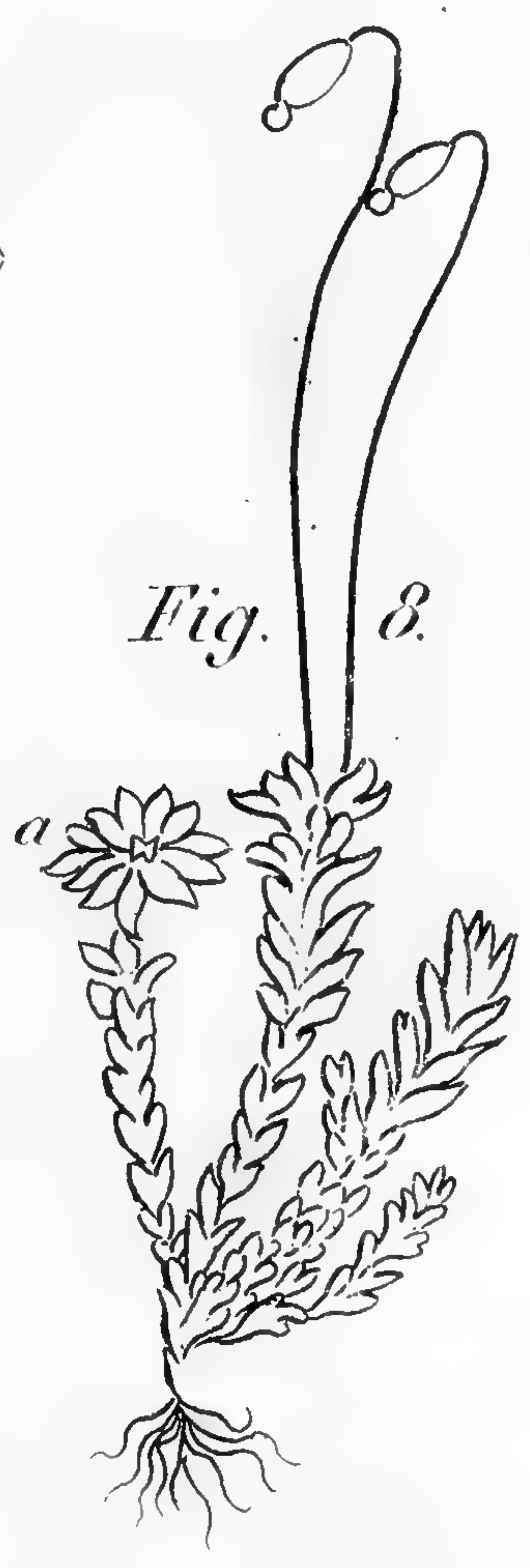


Fig. 8.

Fig. 10.

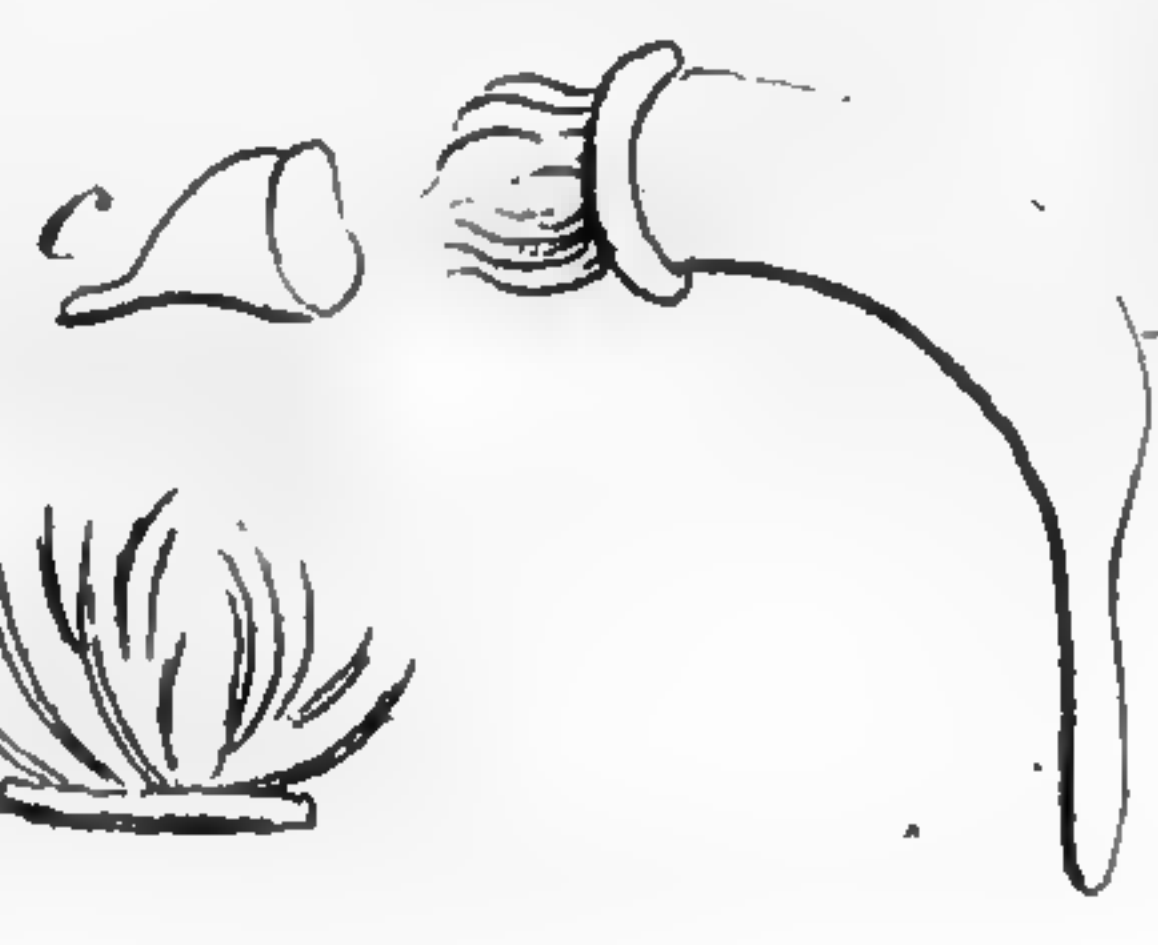


Fig. 11.

Fig. 12.

LECTURE V.

On the Grasses.

HAVING proceeded regularly through the Classes, Genera, and Orders, with their different subdivisions, the young botanist will find some assistance necessary in the study of the graminiferous tribe of vegetables. This elegant assemblage of plants requires a peculiar mode of investigation; but that mode well understood, and the method of accurately dissecting them adopted, it will not be found difficult to obtain a competent knowledge of their structure. The term Grass, as it is vulgarly used, conveys only a vague idea; and a common observer is surrounded in his walks by a variety of species, while he is not conscious of the precise existence of a single individual. It is only of late years that this useful and curious tribe of plants has been attended to; so that the knowledge of the most common and valuable vegetables of the creation is yet in it's infancy. They have been confounded under one common name in general,

and the few, which have been distinguished by a particular appellation, are far from being universally known by it. Mr. Curtis, in this part of the vegetable kingdom, as in every other, has applied his researches to the most useful purposes. He has attracted the notice of the rich by his more splendid delineations of a variety of grasses in his London Flora; while he has diffused through all ranks a knowledge of those genera, which are every where to be met with, by the low priced publication of his Practical Observations on British Grasses; a work from which a general knowledge of the outer habits of our most common meadow grasses may easily be attained. This tribe forms one of the natural orders of Linneus, and possesses a variety of common characters, by which several sorts of corn are arranged with those genera, which are more commonly known by the name of grasses. There will be found a striking agreement in the parts of fructification of all the grasses which may be examined; but this is not more remarkable than the similarity of their general air, their manner of growth, and their whole appearance. A simplicity of structure characterizes the whole class; they have uniformly

formly a simple, straight, unbranched, hollow stem, strengthened with knots at certain intervals; this, which is commonly called the straw in corn, is termed by Linneus the Culm. At each knot there is always a single leaf, which serves as a sheath to the stem to some distance; when it spreads out into a long narrow surface, of equal breadth all the way, till it approaches the end, where it draws off gradually to a point. The leaf is invariably entire in every species, has neither veins nor branching vessels, being only marked longitudinally with lines parallel to the sides, and to a nerve or ridge, that runs the whole length of it. Another curious circumstance, almost peculiar to this tribe of plants, and common to them all, is the seed not splitting when it germinates, but continuing entire, till the young plant is sufficiently nourished by its mealy substance to seek its own food; at which time there remains of the parent seed only the dry husk. These plants are termed by Linneus one-cotyledoned, or one-lobed. In wheat this may be well seen; and if the seed is pressed betwixt the fingers, when the plume has risen an inch or two above the ground, it will be plainly

perceptible that the skin only remains. The common meadow fox-tail will show the peculiarities which may be found in the whole order of the grasses; and it is better to study their characters in the natural plant than in plates; although Mr. Curtis's London Flora will afford much amusement and information upon the subject. Upon examining the leaves and sheaths by a microscope, many of them will be found furnished with bristles, which give them the appearance of a saw; from this circumstance, or the contrary, the species are frequently distinguished one from the other. The parts of fructification, from their want of splendour, commonly pass unnoticed, although their beauty and structure are such as must excite our highest admiration, when known. The natural character of the flowers of grasses is their having a glume, or husk, which is the term given to their calyx by Linneus. This glume is composed of one, two, or three valves, generally only two; the larger valve hollow, and the smaller one flat. These valves are a kind of scales, with their edges commonly transparent, and most frequently terminated by a pointed thread, termed by Linneus *arista*, or awn. The

awn

awn is particularly strong in the *hórdeum* genus, of which barley is a species; but may be found in a less degree in various other génera, though not constant through every species; whence it's presence or absence is used by Linneus as a specific distinction. The corol of grasses is also termed a glume, and in reality is only a dry skinny husk, consisting of two valves. The calyx and corol should be compared with a magnified drawing, and the natural parts looked at through a microscope; their construction will then be understood. The divisions of the outer glume, or calyx, ought always to be attended to, as it is often made use of by Linneus as a mark of the génera. Betwixt the glumes, or corol and calyx of the grasses, the young botanist may find himself perplexed; but it must be remembered that these parts of fructification are not, in general, distinctly defined at present; therefore they must be understood according as they have been distinguished by Linneus. The inner glumes of the grasses are to be esteemed the corol, the outer the calyx. The flowers of this tribe have also universally a visible nectary, consisting sometimes of two very small oblong leaves, placed at the

base of the germe, and sometimes different kinds of scales in the same situation, which are distinctly shown in Mr. Curtis's plates of the *hólcus móllis*, creeping soft grass, *mélica unifróra*, single flowered melic grass, and *mélica cærúlea*, blue melic grass, and are not difficult to be seen in the natural flowers. Though very minute, the leaves, of which the nectaries are composed, may be seen at the base of the germe of the flowers of wall-barley. These leaves nearly resemble the corol, but are less, and transparent; they are named nectaries by Linneus; but as they furnish no generic distinction, they are not noted in the characters of all the généra. The number of stamens, that will generally be found in these flowers, is three, with two pistils, within the same cover. But there are exceptions to this rule, which shall be explained presently. The stamens have three hair-like filaments with oblong anthers of two cells. The styles of the pistils are downy, bent back, with their stigmas beautifully feathered, in some species large and branching, which, with the anthers waving on their long filaments, form a most elegant appearance; but their parts are so delicate and minute, that

that they are seen to greater advantage if viewed through a microscope. The close spiked grasses do not show the parts of fructification so well as those with looser spikes, or the panicled kind. In feather-grass, *Stipa pennata*, they are very well seen, if examined in a proper state; but it is even more necessary to investigate these flowers, before their anthers have discharged their dust, than those of the other classes; for as soon as the cases containing it are burst, the whole plant assumes a withered aspect, and all parts, except the seed, fall to decay. These flowers have no seed-vessel, and only a single seed; which is enclosed by either the calyx or corol, from which, when ripe, it is emitted in various ways. The twisting of the long awn of feather-grass, in order to extricate itself from its receptacle, which in this tribe is the stem lengthened out to serve that purpose, gives it a very peculiar appearance. This will also happen if a bunch of the seeds be gathered, and bound tightly together; they will twine themselves into all kind of directions, till they get loose from the bondage which has been imposed upon them, and thus commit themselves to the earth, where they vegetate and produce a
new

new progeny. The parts of fructification may be well seen in the flowers of the bríza máxima. The beautiful drooping spikes of this species are peculiarly elegant from their tremulous motion, caused by their slender peduncles, whence the genus derives it's common name of quaking grafs. Although the characters here given of the parts of fructification are all found nearly constant in those génera, which are placed in the class Triándria, there are others which fail in the classic character of the number of stamens, and are thence placed by Linneus in different classes; which separation of plants, manifestly of the same natural order, is the more extraordinary, as, in some cases, he has not thought it necessary strictly to adhere to the observance of the classic character, when it has so directly militated against an obvious similitude in every other part of the fructification, as in hólcus lanátus, but has made the difference the foundation of a specific character. The hólcus lanátus, meadow soft grafs, having some of it's flowers deficient in the proper number of stamens and pistils, which would rank it in the class and order Triándria Digynia; Linneus

neus has torn it from all it's natural connections, and placed it amongst a tribe of plants, in the class Polygámia, to which it has no affinity. His most flagrant faults, however, of which this must be esteemed one, admit of this excuse, namely, the greatness of the work, with which he has enlightend the botanical world. We ought to be less surprised, that we find in it a few imperfections, than that there are not more. This regarding the hólcus may probably have escaped, by some accident, his correction, as it is not uncommon to find the same imperfection in the flowers tríticum and hórdeum, wheat and barley, and some other grasses, which cannot be considered as constant, but may arise from a variety of causes: and, as the character of the classes is purely arbitrary, it may admit of a doubt, whether in all cases it would not have been better to have observed it uniformly, than ever to have deviated from it. So, for instance, the genus anthoxáanthum, which in every particular agrees with the character of the grass tribe, except that of it's number of stamens, which are only two, and that without variation. From this circumstance Linneus has placed it in the class Diándria,

two-

two-stamens. Had he done otherwise, a young botanist must have found himself much perplexed; the classic character being the first that he would refer to, he could never find the *anthoxanthum* in a class, the essential character of which was three-stamens, though, from it's general appearance, he could not expect to find it separated from the rest of the grasses. There are some peculiarities in the fructification of *anthoxanthum odoratum* which are worth attending to: a specimen of it should be dissected, and compared with a magnified drawing of it's different parts. It agrees with many other grasses in it's small spikes, containing only one flower, but differs from the whole of the tribe in the following particulars: one of the valves of the glume, or calyx, is small and membranous, the other large, and wrapping up, as it were, the whole of the fructification. These glumes have been observed not to open and expand themselves, as in the *avena* genus, and other grasses, but the stamens and pistils have the appearance of pushing themselves out of the glumes, which remain closed; the glumes of the corol are not like those of other grasses, but are remarkably hairy, each having an awn, the longest

longest of which springs from the base of the glume, and is at first straight; but as the seed becomes ripe, the top of it is generally bent horizontally inward; the other awn arises from near the top of the opposite glume or valve. The nectaries also differ as much from their common structure, in this order of plants, as the other parts of fructification; they are composed of two little oval shining valves, one of which is smaller than the other: these closely embrace the germe, and are difficult to be seen, unless they are observed at the moment of the anther's protruding from between them, at which time they are very distinct: as soon as the anthers are excluded, they again close on the germe, and form a coat to the seed, which remains with it. The anthoxánthum is the grass, which gives the fragrant scent to hay; and if the leaves are gathered, and folded up in paper, they will retain their agreeable scent for a long time: hence the specific name given to it by Linneus, of odorátum. It has been said to be the only english grass that has fragrance; and this may be true respecting the leaves. But Mr. Swayne, in his account of pasture grasses, informs us, that the flowers

flowers of the annual poa have a sweet smell like those of the *reséda odoráta*, *mignonette*; and that the scent remains in the flowers when dried. The *anthoxáanthum* is said to have two modes by which it is propagated; first, the common way, by seeds; and secondly, by bulbs formed upon it's stems, which fall off, when mature, and strike root into the ground. This circumstance is said also to take place in many of the alpine grasses, by which means their species are preserved, which would otherwise be annihilated, so perpetually are their seeds devoured by small birds.

The seeds with which canary birds are fed are from a species of *phálaris*, deriving it's specific name, *canariénsis*, from the place of it's native growth, the Canary islands. The ribbon-grass is also a variety of another species of *phálaris*, the *arundinácea*, or reed *phálaris*, and makes an elegant appearance amongst the gayer colours of a flower-garden. The genus *avéna*, of which the common oat is a species, is obviously marked by a twisted and jointed awn, which issues from the back of the corol. The seeds of *avéna fatua*, fool's oat, or, as it is commonly called, wild oat, exhibit

exhibit an amusing spectacle. If placed on a table, after having been moistened in water, they twist themselves about with so much appearance of life, that the plant has been called the animated oat. There is also a curious circumstance belonging to the seed of barley: it's awn being furnished with stiff bristles, which all turn towards the point, like the teeth of a saw, as this long awn lies upon the ground, it extends itself in the moist air of the night, and pushes forward the barley-corn, to which it adheres: in the day it shortens, as it dries; and as these points prevent it from receding, it draws up it's pointed end, and thus, creeping like a worm, will travel many feet from the parent plant. The ingenious Mr. Edgworth constructed a wooden automaton upon the principles of a barley-corn, which succeeded so well that it walked across the room, in which it was kept, in the space of a month or two. Wheat, *triticum hybérnum*, the most nutritive of the various grains which are applied to the use of food, is found in most parts of Europe and Asia. Where the climate is too hot for it's cultivation, as in the torrid zone, it's place is well supplied by what is commonly
called

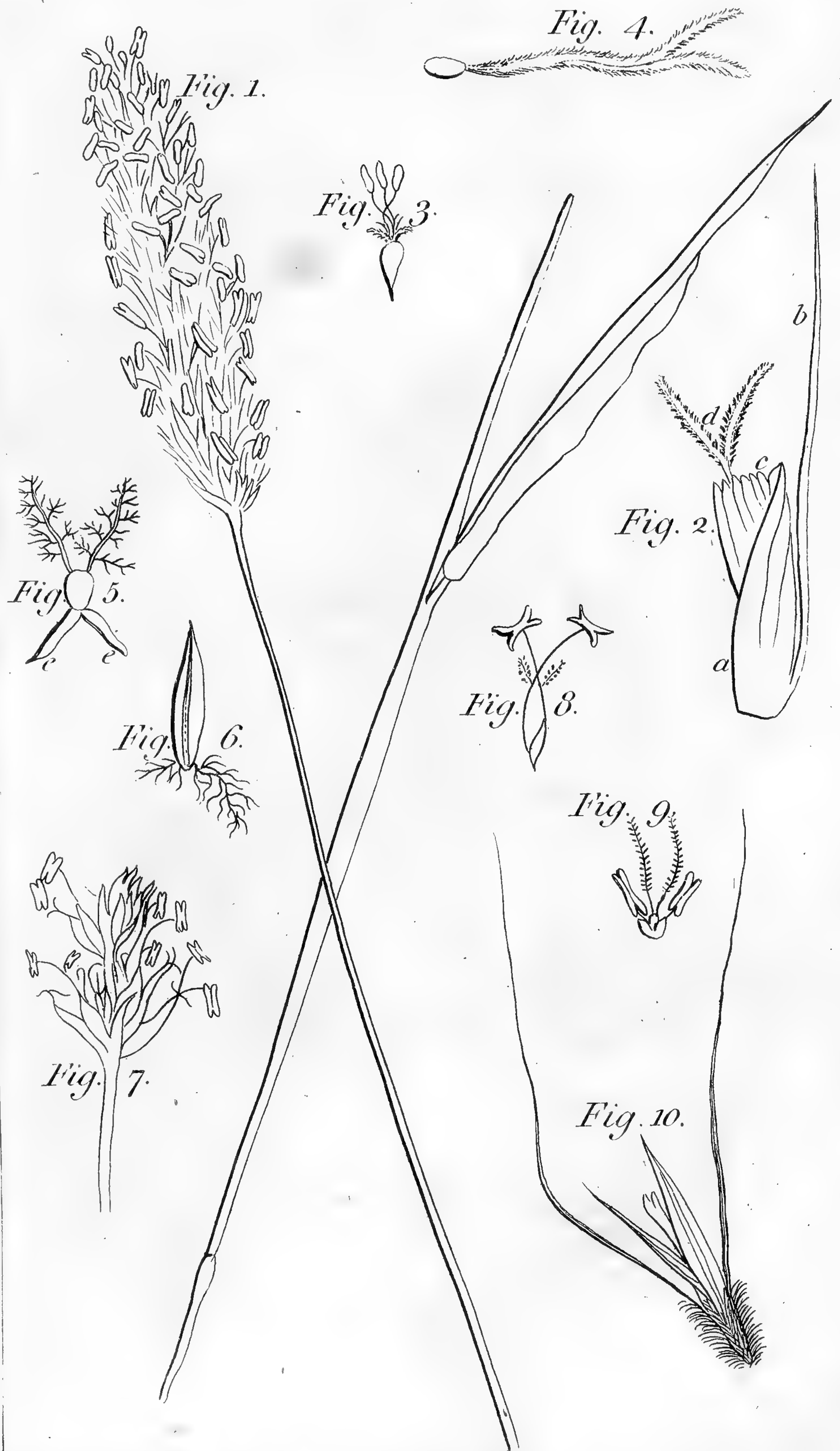
called India, or Turkey wheat, which is a species of *zéa*; a genus placed by Linneus in the class *Monœcia*, one-house. Although rice is ranked among the grasses in the natural orders of Linneus, he has separated it from them in his artificial system, in consequence of it's being found deficient in the essential character of his classical arrangement of those genera to which it bears so near an affinity. He has placed it in the class *Monœcia*. Rice is a species of the genus *ory'za*. In most eastern countries this grain is the chief support of the inhabitants; and, so far as it is used for food, is wholesome and nutritive. But as we too often convert what, if properly used, would be a blessing into a curse; they make from it a spirituous liquor, called by the english arrack; which, like all other spirituous liquors, may be esteemed a slow poison. Most of the plants belonging to the natural order of grasses afford plentiful and nutritive food, not only to mankind, but to beasts, birds, and insects, and have the remarkable property of not being destroyed, though continually trampled upon; indeed, they are constantly renewed by seeds; as their flowers, the same as in other plants, are never eaten by cattle,

cattle, which, if left at liberty in the pasture, uniformly reject the straw on which the flower grows, devouring only the herb of the plant, so that the seeds which escape the small birds, ripen, fall to the ground, and renew their species. Those grasses which are more liable to have their seeds destroyed, or which, from the coldness of the climate they inhabit, cannot bring them to perfection, become viviparous, and perpetuate their species by a bulbous progeny. The similarity of calyx, corol, and nectary, in the grass genera, and the minuteness of their dimensions, will frequently prevent their being accurately distinguished from each other, till the student is become familiar with the appearance of all these parts; and he will then find them not more difficult of investigation than the fructification of many other plants.

EXPLANATION OF PLATE V. PART II.

FRUCTIFICATIONS OF GRASSES.

- Fig. 1. A Spike of *Alopecúrus Praténfis*, Meadow Fox-tail.
- Fig. 2. A Floret magnified. *a*, The Glume of the Calyx, with it's long Awn fixed to the Base. *c*, The Stamens. *d*, The Stigma.
- Fig. 3. A Floret of the natural size separated from the Spike.
- Fig. 4. The Stigma and Seed.
- Fig. 5. The Germe and Styles of *Póa triviális*. *e, e*, The Nectary Glands.
- Fig. 6. The Seed with a woolly substance at it's base.
- Fig. 7. Part of a Spike of *Anthoxáanthum*.
- Fig. 8. The Stamens, Styles, and Seed, with the adhesive Nectary Glumes.
- Fig. 9. The Nectary Glumes at the moment of protruding the Anthers.
- Fig. 10. A Floret of *Avéna Fatua*, Animated Oat.



LECTURE VI.

Specific Distinctions, and Double Flowers.

THE part which yet remains to be considered of the Linnean system is the specific distinctions, or those characters by which every individual is distinguished from others of the same genus. In this part of botany we are even more obliged to Linneus for the order, that he has introduced, than in any other. He was the first who began to form essential specific characters. Before his time there were no specific distinctions worthy of notice; from which deficiency arose great confusion. Now the knowledge of the species consists in some essential mark or character, by which it alone may be distinguished from all other species of the same genus. These distinguishing characters are noted by Linneus after every individual of a genus; and this is called the specific description. To each species he has given a name appropriated to itself, which he has termed the Trivial Name.

Q 2

Sometimes

Sometimes this name expresses some quality of the plant, to which it belongs, but as frequently is arbitrary; and perhaps it would be better that it was always so, as the names by which we distinguish the individuals of a family. It may require some trouble at first to acquire the use of arbitrary names, but the advantage of them when acquired is every day demonstrated. Of this we cannot doubt, if we attend to the confusion occasioned in common conversation, by persons who will not use the proper name of whatever they attempt to describe: they introduce all kind of circumstances to make themselves understood, and at the end of their endeavours leave the person, whom they would inform, in despair of ever acquiring any knowledge from their descriptions. Could the distinguishing mark of each plant be expressed by one word, and that word be used as the name for the individual, or what is called the trivial name, it would greatly facilitate the knowledge of plants; but this we cannot at present hope, though probably we shall see great improvement take place in this part of the Linnean system of botany, as well as in some others.

It

It is desirable that all young students in botany should make a point of using the terms and language of the science; and herein will be found the superior excellence of the Lichfield translation, that, in acquiring the language of that work, we become able to understand any descriptions of plants which may occur to us in latin; whereas, when there is an attempt made to form the terms more after the english language, they cannot be made use of except in conversation with an english botanist: the same objections occur against forming either the generic or trivial names in our own tongue in preference to a literal translation of those given by Linneus. One or two instances will show the inconvenience of such a practice. Out of six species of *plantago* described in the Botanical Arrangement of British Plants, there are only two which have their trivial names translated; so that a student, who formed his language from that work, would find it almost equally difficult to understand a Linnean botanist, when he spoke of *plantago media* (middle), or *plantago lancéolata* (lanced), one being termed hoary, and the other rib-wort, as if he was ignorant of the science.

Q 3. Also

Also *rúmex pulcher*, or beautiful, has the trivial name fiddle given to it; and *pulmonária officinális*, officinal, is called broad-leaved. Many more such false names might be enumerated, which are equally awkward and injurious to the science, and whatever true botanist ought to avoid. I warn all my young readers strongly from the use of such terms, as they may hear them not unfrequently defended, as being more easy to acquire: but such defenders are too idle to think much on the subject, and of course are little aware of the narrow extent to which their botanical knowledge can carry them, if founded only on the language of their own country, and of the plants contained in it.

But to return to the circumstances from which Linneus has taken his specific descriptions: he lays it down as a fundamental rule, that they are to be formed from such parts of plants as are not subject to variation; great inconvenience having arisen from the want of observance of this rule among former botanists; every variety being ranked by them as a distinct species. Colour is decidedly one of the least permanent characters to be found in plants, consequently not to be admitted into the

7

specific

specific character. However, it must be acknowledged, that in contradiction to more than one of his own rules, Linneus has made use of colour, and other variable properties in plants, to distinguish them individually one from another. Linneus esteemed the root of plants a true specific mark; but, from the difficulty of obtaining a sight of it, has never made use of that part as such, if any other, equally permanent and more obvious, could be found. The trunk and stalks of vegetables, in many instances, afford such essential differences, that they serve to ascertain the species beyond a doubt. In the genus *hypericum*, three of the species are accurately distinguished by their stems being round, two-edged, and square. The different kinds of inflorescence and fulcra furnish also permanent marks. Linneus too has made use of parts of the fructification for the purpose of discriminating the species, which is done with good effect in many instances, though certainly in a few cases, in contradiction to the principle, on which the classes are founded, if considered with strictness, as in some of the grasses; but where the characteristic mark of either class or order is not interfered

with, the parts of fructification form obvious and agreeable marks of specific distinction, as in some of the *hypericums*, the species are distinguished by their number of styles; and in *gentiana*, the form and division of the corols afford an obvious and permanent difference, which cannot be mistaken by the most superficial observer.

But before the young student can hope to arrive at a ready discrimination of plants, he must study leaves under all their various forms. It is from leaves that the most elegant and natural specific distinctions are taken. Nature delights in variety in none of her works more than in that of leaves. The different sorts are exceedingly numerous, and ought to be attentively studied by every pupil in botany. In the present part of the subject they are to be considered only as marks of distinction, by which the individuals of a genus are known from each other. Their use and formation belong to another part of the study. They must be taken methodically, and they will not then be found difficult to understand, with the assistance of the plates and botanical terms and definitions given at the beginning of the *System of Vegetables*.

Vegetables. The *form* of leaves is first to be considered, by which must be understood their external structure. Respecting their form, they are divided into simple and compound leaves. Simple leaves are those which have only a single leaf on a petiole, or foot-stalk. These simple leaves may differ in respect to many circumstances, but they are still simple, if the divisions, however deep, do not reach to the mid-rib. There are sixty-two ways in which a simple leaf may be diversified, all of which must be studied with the plates, and the terms of explanation annexed to them. The genius of Linneus is more conspicuous in this part of his subject than even in any other. He has formed a language, which, in the most concise expressive manner possible, depicts such a variety of forms of leaves, fruits, flowers, stems, and seeds, as no other was ever before made to describe. The introduction of these excellent terms to english botanists we owe to the Lichfield translators of Linneus's works. To the System of Vegetables are prefixed a preface and advertisement, which should be read by all young botanists. Attention and habit will render the amazing variety of form in the simple leaves

leaves familiar. The language of Linneus, as applied to the species of plants, must be studied, and may be understood without much difficulty. He has taken words expressive of well-known figures, as the words oblong and egg, which, simply used, signify that the leaf or seed is one of those forms; by compounding those words a form between both is expressed; if it partake most of the oblong, that word precedes the egg, and contrariwise; so that the two words, oblong and egg, are made to represent forms of four kinds very nearly allied. Thus has Linneus compounded all the different forms under which leaves can appear; and by having done so has been able, in a few words, to present before our eyes the essential specific characters of a variety of plants; which by other authors are described with so little precision, and so diffusely, that we are bewildered by the innumerable distinctions, to which we have to attend.

In order to attain a precise idea of these forms the student must begin by comparing the plates. The leaves of daisie (*béllis*) are oblong, those of beech (*fágu*s *silvatica*), and pepper-mint (*méntha* *piperita*), egg-form, of
violet

violet heart-form, rosemary (*rosmarinus officinalis*) and crócus, linear; or every where of an equal breadth. When he has well studied the simple forms he must then endeavour to understand those which are compounded from them; and, by drawing, compound the forms himself, till they become familiar to him. *Pulmonária officinalis*, commonly called Jerusaleme cowslip, has it's radical, or root leaves, of the form betwixt egg and heart; in expressing which, and the rest of the compound forms, the Lichfield translators have most happily imitated the conciseness of their author; and in their language you will find the terms, egg-hearted, heart-lanced, used instead of between egg and heart-shape, heart and lance-shape, and so of them all. The term arrowed is used for arrow-shape; lyred for lyre-shape; twoed, or threed, for growing two together, or three together: indeed, instances occur so frequently of the agreeable conciseness, with which the language of the translated System of Vegetables is formed, that it would be difficult to enumerate them all: it is a work of the highest value to an english botanist. An outline of the forms which may be found in leaves,

leaves, both in their simple and compound characters, being understood, those circumstances which constitute a compound leaf should be considered. It has been shown, in treating of simple leaves, that they continue to be so denominated, be their divisions ever so deep, provided those divisions do not extend to the mid-rib; but when that takes place, the leaf becomes compound; so that it is in fact a small branch composed of a number of individual leaves, which separate leaves are frequently furnished with each a petiole, uniting them to the common petiole, or foot-stalk; which, running through the whole, is called the mid-rib. In some instances it may not to a young botanist be very easy to distinguish a compound leaf from a branch; but there are two rules, by which they may always be known asunder: 1st, buds are never found at the base of the lobes, or divisions of a compound leaf; but are formed in the angle made by the whole with the stem, from which it issues; 2dly, the branches of woody plants continue, after the leaves are fallen: this never happens with a compound leaf; for, however nearly the common foot-stalk, from which it is formed, may resemble the other in appearance, it

always

always falls off, either with or after the leaves it supports. The leaves of robinia, rose acacia, afford a good example of the compound character, and also of the two rules that have just now been mentioned. There are three kinds of compound leaves, the compounded, decomposed, and super-decomposed. The first has been explained; and, although there be but two divisions from the same common petiole, it is a compound leaf. The terms decomposed, and super-decomposed, are applied to different modifications of the compound leaf; and again these modifications admit of such a variety of others, which are distinguished each by an appropriate term, that nothing but practice, and the method recommended in regard to the study of simple leaves, can bring the pupil acquainted with them. The feathered, footed, winged, paired, are all different forms of the compound leaf; so is the fingered, of which an example may be seen in the horse-chestnut, *æsculus hippocastanum*, and lupine (*lupinus*); as these various modes frequently enter into, if not entirely form, the specific character of plants, it is necessary they should be well understood. But, before the compound leaves are attempted, it

it will be well to become perfectly acquainted with the different forms which exist in the simple leaves; as the form of the single leaves, of which the compound leaf consists, is a circumstance generally noted. The System of Vegetables, methodically studied, will carry the student through this difficult part of botany; or, if sometimes he may find himself perplexed, an explanation of the same terms in other books will be of service to him, as he will probably find different words used, which may elucidate the point on which he may be in doubt. There are some other circumstances relative to leaves, which it is equally essential to understand as those which have just now been treated of; these are, the determination, or disposition of leaves, which comprehend four particulars alike belonging to the simple and compound kind, the *place*, *situation*, *direction*, and *insertion*. By the place, we are to understand the particular part of the plant to which the leaf is attached. Situation regards the respective position of leaves one to the other: so leaves are called alternate, when they come out singly, and are ranged gradually on both sides of the stem, as in ivy toad-flax (*antirrhinum cymbalaria*); or
opposite,

opposite, when they come out in pairs, as in myrtle (*myrtus*), and many other plants. These two circumstances of leaves being alternate, or opposite, furnish constant and invariable characters, which are generally found in plants of the same genus, or even of the same natural order. Direction contains the different ways in which a leaf bends from it's stem; the various modes of it's doing so are arranged under the general term 'direction, and must be studied to be understood. Insertion comprises the diversity of manner by which leaves may be attached to their parent plants, each of which has an appropriate term, briefly and expressively explained in the botanic terms and definitions at the beginning of the System of Vegetables, with plates at the end of each volume to illustrate them.

I have now only to speak of such flowers as are commonly called double. To enter far into an account of them belongs rather to the natural history of plants, than to that part of the science which ought to engage the attention of a pupil in the beginning of his studies. It will be sufficient to acquaint him with the unnatural varieties under which flowers appear, that he may not be misled, by the monstrous forms

forms they frequently assume, to look for a genus where there is only a sportive variety. Double flowers are the pride of a florist, as they manifest the art of culture; many of them being formed by over luxuriance of nourishment. Gardeners imagine, that by placing a double stock-flower near a single one, they can thereby procure such seed as will again produce double flowers: but that this is a vulgar error, a very slight knowledge of botany may convince us; for, when a flower is completely double, it is deprived of its stamens, which commonly expand into petals; by which transformation the flower no longer possesses the anther-dust, or essential part to the fertilization of seeds. There are various ways in which vegetable monsters are formed, most of which generally exclude all, or part of the stamens. The unchangeable parts of double flowers are the calyx, and the lower row of petals, by which the genus may be often discovered. Some flowers are only half-double; in which case the stamens and pistils often remain perfect, and hence produce fruit. This happens in the double peach, the fertility of which is sometimes brought as an objection to the Linnean

Linnean system. There is one kind of the double, or multiplied flowers, which is termed proliferous; of this sort is the hofe in hofe polyanthos, and *béllis prolífera*, hen and chicken daify: this is one of the most curious of vegetable monsters, as well as the most beautiful. *Plantágo rosea*, or rose plantain, is wonderfully disguised by it's bracts becoming enlarged, and being converted into leaves. Many flowers become double by the multiplication of their nectaries, and in so many various ways, that it would engage too much time to enumerate them. In the Provence rose the petals are so profusely multiplied as entirely to exclude the stamens. In some other roses may be found stamens, although the flower has a luxuriancy of petals, as in damask rose. The many-petalled flowers are the most subject to multiplication. The one-petalled rarely go beyond a double corol, which is very often seen in them. The compound flowers also are liable to become double; and their beauty is often improved by it; as daify, *béllis*, sneezewort, *achilléa*, and *chryfánthemum sílphium*; but, if we except a few instances, I think single flowers are much to be preferred to double ones.

R

Beside

Beside the varieties occasioned by multiplication, there are others arising from many accidental causes; but the most general cause may be esteemed culture: it is from the gardener's art that we receive so many delicious fruits and vegetables for our tables; culture too is the test, whether a plant be a true species, or a variety. By a change of soil we can produce the most valuable varieties; or oblige them to return to their original form, by refusing them our nourishing care. The ingenuity and industry of man is not seen in any thing more conspicuously than in his culture of corn, which, without the science of agriculture, would be of small value; with it, we must esteem it the first blessing of life. Botanists are careful to distinguish between varieties obtained from seed, and the genuine species, from which they deviate. Such plants will not be found noted in the *System of Vegetables*, which contains only the *généra*, and the permanent species. In the *Species Plantarum* the varieties are distinguished by a capital B being placed immediately before the descriptions of them. What has been explained respecting the changes which take place in the fructification of plants, is equally applicable

plicable to leaves, and to every other part of them; by which they are frequently so metamorphosed, that it requires no small degree of botanical knowledge to ascertain the real plant. Many of these appearances may be effected by art, and have been so by the curious, in order to discover the true cause of such deformities, or of diseases, which are found destructive of vegetation.

THE END.

John Smith (Glasgow) Cat 41 (1965) 629 f 1 S/-





